Telephony.

VOL. XV. MAY, 1908. No. 5

Independent Telephone Men

By R. G. Shelden

WHEN the Iowa Independent Telephone Association, at its last convention, elected James H. Shoemaker president it paid a deserved tribute to a man who has done much for Independent telephony in the Hawkeye state.

Mr. Shoemaker was born in Middle Spring, a small Pennsylvania town, September 22, 1865. In 1872 he removed with his parents to Missouri, whence they journeyed to Marshall county, Iowa, three years later in a "prairie schooner."

Mr. Shoemaker's father was a farmer; and it is to the rugged outdoor life and hard, but wholesome, labor of his boyhood that he attributes the characteristics of persistence, endurance and health which have marked his later years. He is emphatically a believer in the "perspiration" quality of genius.

From 1883 to 1903 he was connected with the construction and operating departments of what is now the Chicago and Great Western Railway, being located as telegraph operator and agent at Reinbeck, Des Moines, Dubuque and St. Paul. It was immediately after severing his connection with the road at the latter place that he entered the telephone field.

James H. Shoemaker.

Mr. Shoemaker's telephone experience covers but five years, and he is emphatic in disclaiming any expert technical knowledge of the business. Owing, however, to his remarkable application and enthusiasm, and a habit of working sixteen hours a day, his five years in the telephone operating field represents a much more extended period when judged by results.

In 1903 a party of men who had acquired a controlling interest in certain properties, now represented by the Corn Belt Telephone Company, engaged Mr. Shoemaker to look after the business details of the enterprise. This was his first experience in telephone work; and when the property came into the control of A. T. Averill, now president of the Corn Belt company, he was made general manager, notwithstanding his plea for the selection of a more experienced man.

From the outset Mr. Shoemaker's telephone career has been a conspicuous success. He has been an enthusiastic and devoted advocate of the principle that telephone operators are public servants, and that their remuneration will be just what the people believe they deserve. He has demonstrated his theory that a thorough cost system is essential to the highest degree of success in telephone operation, and that the actual cost items of construction, maintenance and operation should be known in the smallest detail.

Mr. Shoemaker is treasurer and general manager and a director of the Corn Belt Telephone Company; secretary and treasurer and a director of the United Exchange Company, and vice-president, manager and director of the New Hartford Farmers' Telephone Company. He is thus an active figure in the control of 9,000 telephones and about 2,500 miles of long-distance lines. Although his election to the presidency of the Iowa association came as a surprise to him, his devotion to the cause makes him an honor to the chair.

Trade Mark (TELEPHONY) *Registered in United States Patent Office Copyrighted, 1908., by Telephony Publishing Company, Chicago, Illinois. All rights reserved.*

Editorial Department

INDEPENDENTS' STAUNCH CONDITION.

THE stability of Independent telephone securities is especially noticeable in times of financial depression when many other lines of business find it difficult to keep moving. Attention is called to this fact by A. C. Lindemuth, president of the International association, in a statement made in connection with the Central Union's annual report. The president of that Bell licensee company, of course, embraced the opportunity to strike a blow at the Independents and attempt to show that the Bell is rapidly driving them from the field.

In commenting on the Central Union report, President Lindemuth said:

"The present financial condition and future outlook of the Independent system of telephone exchanges are very gratifying, all of the many thousand companies in the United States with but very rare exceptions having met their interest and other fixed charges promptly and shown a substantial earning during the year. Attention of bankers and other financiers has been attracted to the remarkable showing made by the telephone business during the recent money panic. While all classes of business, even the best, suffered for want of cash funds and found it extremely difficult to procure money on collateral or credit, however good, the daily cash deposits of the Independent telephone companies throughout the country were not only maintained but in many cases increased. The telephone business was practically unaffected by hard times, the reason being that telephone rentals were small in amounts and payable in cash in advance and the telephone being such a household necessity that no one thought of dispensing with it. These facts have impressed investors with the strength and desirability of Independent telephone securities as an investment.

"In the states of Ohio, Indiana and Illinois, the territory covered by the Central Union Telephone Company, the subsidiary company of the Bell, that company, according to the financial statement of L. G. Richardson, its president, has not paid a dividend in twelve years. On the contrary, of the ten or eleven hundred Independent telephone companies in the same territory, all, with but few exceptions, have paid from four to ten per cent dividends on their capital stock during all that time or since their organization, and have continued to do so during the last year with but little or no reduction in amount.

"There has been a decided advance in the Independent telephone system in Central Union territory during the past year, both in physical property and earning capacity. Many of the Independent companies have secured an increase of rates, there being seventeen of such companies in the state of Indiana alone.

"This increase of rates is made necessary because of the phenomenal growth of the Independent companies under competition with the Bell, which growth, at the time of their organization ten or twelve years ago, could not be anticipated and the rates being fixed for much smaller exchanges were not commensurate with the increased cost and extent of the service.

"Although, in its efforts to eliminate competition, the Central Union in the territory named has connected its long distance lines with a few of the smaller Independent exchanges, still, in order to do so, the Central Union in many cases has had to abandon its local exchanges and surrender the local operating field to the Independents. Competition, of course, can easily be eliminated by one of the competitors leaving the field. Many of the Independent companies have rebuilt and greatly enlarged their plants during the past year, thus enhancing the value of their physical property and rendering themselves capable of giving a higher grade and more extended service."

There is a grim humor in President Lindemuth's statement that "competition, of course, can be eliminated by one of the competitors leaving the field." It reminds one of the man who said he kept his opponent "on the run," but neglected to state that he accomplished this by always being in full flight ahead.

WE PLEAD GUILTY.

"FAITHFUL are the wounds of a friend," is the way an old proverb runs, which means, we presume—speaking broadly—that a friend will tell the plain, unvarnished truth about us while a flatterer might stretch the facts in order to tickle our vanity. Every once in a while an enemy or unfriendly critic will blurt out some truth that he thinks is likely to injure the recipient which, on the contrary, tends to help him.

For instance: TELEPHONY received a letter the other day from a man who was apparently in an ill humor with this paper and its policy. He doesn't like TELEPHONY's attitude of criticism toward the Bell telephone monopoly. Among other things this correspondent said:

"When you get ready to make your paper a real, unbiased telephone paper instead of a one-sided Independent movement 'organ' I and others will subscribe."

Then the writer of this advice on how to run a paper proceeded to argue that the Independents and Bell interests should join forces and cease competition.

TELEPHONY is gratified to learn that it is recognized even by the Bell advocates—of which the writer evidently is one—as an Independent organ. It shows that its utterances on this point have not been misunderstood or forgotten. In other words, we plead guilty to the charge of being an Independent organ. As to being "one-sided," it is pertinent to remark that most sincere people prefer a "one-sided" man to a "double-faced" individual. The latter may be more interesting as a spectacle to watch and wonder how and where he stands to-day, but isn't it far more satisfactory to deal with the "one-sided" man? He "stays put" and you always know where to find him.

If standing squarely for the Independent telephone movement twelve months in the year and opposing the crafty schemes of the Bell to crush out all competition is being "one-sided," TELEPHONY pleads guilty to the accusation. At the same time we wish to add that we like the present company this condition finds us in, and have no intention or wish to change. If the truth were known, probably, most all sincere citizens of these United States would have to admit themselves "one-sided" on the topic nearest their hearts.

As to the necessity of the Independent telephone move-

ment having one square-cut, loyal paper to champion its cause, there can be no doubt in the mind of anyone acquainted with the situation. The Bell interests have more than a dozen publications in the field persistently decrying the Independents, hammering their securities, attacking their service and denying even their right to exist. This, too, is exclusive of the subsidized newspapers that print whatever the Bell press bureau distributes in opposition to Independent companies. If anything can be more "one-sided" and less "unbiased" than the Bell publications we are curious to inspect the same.

Meanwhile TELEPHONY will continue to support the Independent telephone cause even at the risk of being accused of "one-sidedness." At all events, we stand alone in this particular, which, no doubt, is a matter of gratification to the Bell octopus.

IT PAYS TO ADVERTISE.

Rochester, New York, April 8, 1908.

Telephony Publishing Company, Chicago, Illinois:

Gentlemen:

Under date of March 13, 1908, Maison Rousselle and Tournaire Societe Anonyme, No. 52 Rue de Dunkergree, Paris, France, wrote us requesting prices for 2,250 meters of 21-pair quality switchboard cable as advertised in TELEPHONY, October, 1907.

We are to-day in receipt of their order dated March 31, 1908, for 2,250 meters 21-pair—2 silk and 1 cotton covered quality switchboard cable—amounting to about $760.

"It pays to advertise."

Yours very truly,

STROMBERG-CARLSON TEL. MFG. CO.

H. C. Slemin, Advertising Manager.

THE WORLD'S TELEPHONES.

THE statement is going the rounds of the press that there are 9,200,000 telephones used in the entire world. According to this information they are distributed as follows: United States, 7,000,000; Europe, 2,000,000; all other parts of the world, 200,000.

In the absence of absolutely reliable data on the number of telephones in operation all over the world, perhaps the above statistics are as good as any other. It has often been said that it is impossible to obtain accurate figures on this point; that changes are taking place so rapidly that all estimates are little better than guesswork. There may be 7,000,000 telephones on the globe to-day—or it may be 10,000,000. Anyway, the telephone is becoming more generally used every day. It is penetrating into territory that never before knew its value. More and more every year the telephone is becoming indispensable to mankind. This is borne out by the statement that the Bell companies recorded an average of 18,624,000 calls a day during 1907, which would be about 75 calls for every man, woman and child in the United States for the year.

The Independents have a big share of the telephone business and are constantly increasing their holdings. It is the sober judgment of men well posted that if there are 7,000,000 telephones in the United States the Independents have 4,000,000 of the total.

The marvel of it all is that the telephone is comparatively a new invention. The entrance of the Independents into the field occurred only twelve years ago. Their wonderful activity, which compelled the Bell trust to get busy, has brought the development of the telephone to the point it occupies to-day. And who can predict how great will be the growth in the future?

"Most of us can still exclaim a little with mild wonder," says a New York Times editorial, speaking of the telephone's wide use, "when our 'party' is anywhere from 500 to 1,000 miles away and we hear his words or hers rather more plainly than if they came from a next room, but when the separation is only by the width of a city we no longer give the matter a thought—except, possibly, to ask once in a while how folks could get along without this facilitator and accelerator of existence.

"And that really is a mystery. Of all the inventions of the last century, the telephone unquestionably added more to general convenience than any other. The steps it saves daily could hardly be computed by using the number of daily calls as a unit, and much as we all growl at the size of the telephone bills, they really do not count beside the economies the telephone makes possible."

BELL ALDERMEN DEFEATED.

NO DOUBT the long fight over the Chicago telephone franchise is still remembered—especially by Independents who were disappointed because the Chicago Telephone Company—a Bell licensee—obtained what was considered too advantageous a bargain from the city council. The April election brings the matter again before the public, and in a most significant manner. Four of the aldermen who displayed a great friendliness for the Chicago Bell Company on the committee which reported the franchise ordinance were up for re-election and were defeated. It is generally conceded that the reason they were beaten was because of the adverse criticism they and the committee received for showing a keener interest in behalf of the telephone company than for the public rights they were supposed to represent. These four men had served many years in the council, and under ordinary circumstances would have been re-elected without a doubt. The belief generally held is that they were retired from public life largely because the people—the voters—were out to punish them for paying more attention to the wishes of the Bell concern than those of their constituents and the welfare of the city at large.

Apparently this same theory has taken a strong hold on the fancy of Alderman Young, the chairman of the committee which reported the Bell's franchise extension. Alderman Young's term is not up until next year, but after scanning the returns of election day, April 7, he promptly announced that he would resign as chairman and under no consideration serve another year. It requires no prophet to guess what Young's motive is. The fate of his four colleagues who were defeated this spring gave Alderman Young a strong premonition that he might run against the same snag in 1909 if connected with the committee at that time. So he quietly withdraws now, hoping that the people will have forgotten then that he was chairman when the Bell got its franchise extended.

In a way, this shows that the public doesn't like the Bell and its methods in Chicago any better than in many other cities. Public officials who show undue friendliness toward the octopus, and to the detriment of public interest, are likely to be called to account.

THE BELL REBUFFED.

HERE is a sample of what is frequently seen in the newspapers recently:

"Nelson, Neb., April 8.—The Nuckolls County Telephone Company held its annual meeting Monday. The following are the new directors: J. C. Chamberlain and S. A. Lapp, Nelson; Mr. Henry Kinnison, Angus; J. R. Parsons and Mr. Peterson, Ruskin; R. Greenwood, Nora; Chas. Malsbury, Cadams. A five per cent dividend was voted. A representative of the Nebraska (Bell) Telephone Company was present and made a proposition towards uniting systems in this county, but the proposal was refused."

The Bell octopus is just as industrious as ever in holding out its lure to Independent competitors who have made it trouble, but the bait usually is rejected.

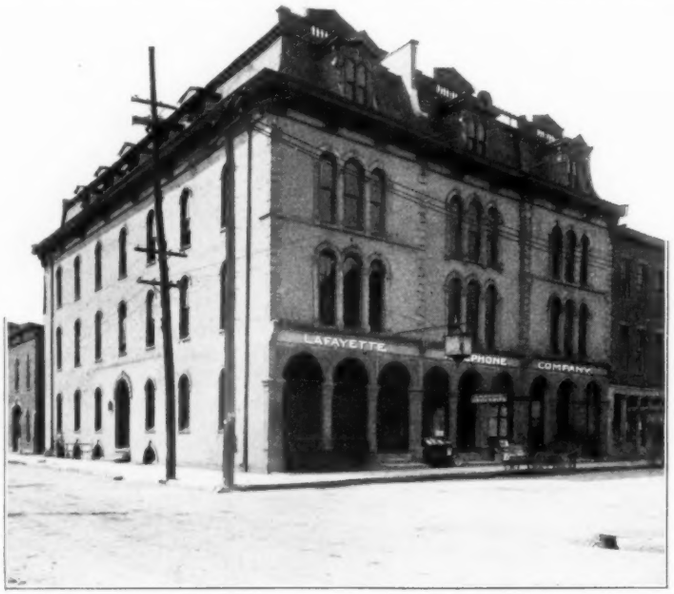
THE LAFAYETTE TELEPHONE COMPANY

One of the Oldest and Most Prosperous Telephone Exchanges in the Independent Field.

By J. C. Ames.

THE Lafayette Telephone Company was organized in 1894. At that time the Central Union, or Bell company, was giving service to 220 subscribers. The Lafayette Telephone Company started to give service March 1, 1895, with 300 subscribers, the plant being constructed by the International-Harrison Construction Company under contract. Those were the early days when series telephones sold at thirty dollars apiece and switchboards at ten dollars a drop. The first installation of equipment made by this company was at these prices, the equipment being made by the Harrison International Telephone Manufacturing Company. The company was a success from its inception. It was localized, starting in with something like seventy-five local stockholders. Like all Independent plants, its growth was more rapid than its capital would justify.

In the year 1899, when it was serving something over 1,000 subscribers, it discarded the old Harrison equipment and installed a 1,000-line board of the magneto transfer type, made by the Sterling Electric Company, partly rebuilding its outside plant at that time. Its growth has been continuous and it has again outgrown its plant and equipment. For the past year it has been reconstructing its outside equipment, making it underground and all cable plant. It has purchased a new building for its home and has installed 6,000-line capacity throughout of the Sterling Electric Company common battery multiple equipment. The reconstruction work was done by W. H. Crumb & Company, Chicago, who have built a number of Independent exchanges.



Exchange building Lafayette (Indiana) Telephone Company.

The year just closing for this company has been a most prosperous one. It has been compelled to turn down applicants for service on account of its limited capacity, owing to the rebuilding of the exchange. It has paid one and one-half per cent quarterly dividends upon both its common and preferred stock for nine consecutive years. All of the stock of the company is held in a voting trust, which precludes any possibility of any portion of the same being transferred to Bell interests or any interests antagonistic to the company.

The Lafayette Telephone Company now has 150 stockholders, is thoroughly a home institution and is owned and managed by sagacious and capable business men.

The officers and board of directors controlling the property are: William Horn, president; E. V. Burt, vice-president; O. P. Friberg, secretary; W. S. Baugh, treasurer, president American National Bank; George P. Haywood, attorney, director American National Bank; Thomas Duncan, director, president Duncan Electric Company; Leopold Dryfus, director, president Dryfus Packing Company; Edgar A. Taylor, director, tailor; Will R. Wood, director, state senator and attorney at law. F. O. Cuppy is the general manager and largely responsible for the later day success of this company.

The company is now giving service to 3,800 subscribers with 400 upon its waiting list. It not only gives service to the citizens of Lafayette, but to all the farmers in the surrounding country. It has the best of toll line facilities, partly owned by the company itself and partly working in operation with the New Long Distance Telephone Company of Indiana. It is safe to say that there is no community of like size in the United States that is getting as good telephone service at a lower rate and making such satisfactory returns to the stockholders as the Lafayette Telephone Company, which is largely due to its popular and efficient management.

The Central Union Telephone Company some fourteen months ago rebuilt the city of Lafayette at an expense of probably $150,000, putting in a modern underground system with common battery multiple equipment, expecting to make great inroads upon the business of the Lafayette Telephone Company, but it was figuring without its host, as the public did not accept the bait, but remained with the Lafayette Telephone Company until its new equipment was in place and working.

The Central Union probably has 400 paying subscribers in the city.

A description of the property and the plant of the Lafayette Telephone Company will probably interest our readers.

The home of the company is situated upon the corner of South and Fourth streets, in a four-story brick and stone building, which property is owned by the company. It occupies the entire four floors of the corner building, the first floor being occupied by the lobby for the public, long distance booths, the general office, private office of the general manager, superintendent's private office and the secretary and board of directors' room.

Upon the second floor is located the operators' rest room, operators' dining room, operators' kitchen, operators' locker room, the rack room, power plant and battery plant.

The entire third floor is given up to the main exchange and toll room.

In addition to this exchange, the Lafayette Telephone Company operates a magneto exchange in West Lafayette,

Terminal room.
Main switchboard (6,000 lines capacity).
Operators' rest room.
Office of F. O. Cuppy, general manager.

Four position toll board.
Chief operator's desk.
Wire chief's desk.

Power and terminal room.
Directors room and secretary's office.
Rear of main switchboard.
Locker room, kitchen and dining room.

Views of the Lafayette Telephone Company's exchange, Lafayette, Indiana.

this magneto exchange accommodating 800 subscribers, using the Bell type board made by the Sterling Electric Company, trunking between the two exchanges. The booths and furniture of the main office are of mahogany, with marble wainscoting and brass counter fittings; in fact the entire fittings and furniture of the building are of mahogany.

The manager's office is a light, spacious, well appointed room. The directors' room is in the rear of the building and would do justice to any company.

The half-story basement is used as a stock room, repair room and linemen's quarters and is equipped with lockers, lathes, benches and devices necessary to do any repair work. The entire main floor is laid with mosaic tile.

On the second floor, the front half is devoted to the convenience of the operators, giving them a rest room, dining room, kitchen, locker room and toilets. The rear half of the second floor and the entire third floor is devoted to the mechanical and electrical part of the equipment. The fourth floor is devoted to storage purposes.

The toll and long-distance room is situated in the front of the third floor, a glass partition separating it from the main exchange room, which enables the chief operator to have constant supervision over both the local and the toll force.

The entire building is heated by hot water, lighted with electric light, equipped throughout with drinking fountains and fans and every other little convenience which makes a plant complete.

In the entire rebuilding of the outside work the company has laid about 100,000 feet of vitrified clay conduit and drawn in thousands of feet of 400 pair cable. As before stated, it is now a modern, all-cable plant, with no open air leads.

These new quarters and new equipment were occupied and put in operation January first, 1908.

The equipment, such as switchboard, telephones and protective devices, was manufactured and installed by the Sterling Electric Company. The switchboard is equipped with its two-relay, "simplicity" multiple circuit.

The switchboard installed has a capacity of 6,000 lines, with 3,000 lines installed. The woodwork is of quartered oak, and, as a whole, is a handsome piece of furniture.

The board is equipped with all the latest known devices in the way of trunks, supervisory circuits, test circuits, which go to make up a complete, modern exchange and keep down the cost of maintenance. Each cord circuit is equipped with four-party designating key.

The toll board, which is a four-position board, located in the front of the switchboard room, is of the same general design as the main board, especially equipped and constructed for toll work.

The chief operator and monitor's desk is a two-position desk with all the auxiliary equipment known to modern telephony for the proper supervision and control of common battery work.

The rack room contains the main distributing rack, completely equipped with heat coil and carbon protectors for the entire exchange, with the modern test-in features. It also contains the intermediate rack and the relay racks, with full complement of Sterling duplex relays.

All of this equipment is joined together by iron runways and neatly cabled. All of the power leads, both inside and outside, are brought into the exchange upon marble power boards with oak bases, these power boards containing the necessary switches for manipulating the current in its different ways, necessary meters, and the necessary indicating machines, consisting of Weston voltmeters and ammeters.

The charging and ringing machines are motor driven, made by the Holtzer-Cabot Electric Company. These are mounted upon slate slabs, with glazed brick foundation.

The storage battery plant consists of duplicate cells of chloride accumulator battery, made by the Electric Storage Battery Company of Philadelphia.

In the rack room is located the two-position wire chief's desk, of the same general design as the switchboard and chief operator's desk, this desk being thoroughly equipped with all the necessary test circuits to make any telephone test required, either inside or outside.

The installation forms a model exchange in every respect, one of which the company is proud, and which will enable it to give the best of service to its patrons at the least cost of maintenance. We cannot but predict for the Lafayette Telephone Company the same successful future as it has had in the past.

Exterior and interior views of the accounting department Lafayette (Indiana) Telephone Company.

FREE SERVICE ABOLISHED.

AS A result of a conference between the railroad commission and representatives of the telephone companies of Wisconsin all free telephone service in that state is to cease. The commission has announced that it will make a classification whereby it will be necessary for every subscriber to a telephone company to pay. This will cut out all free service to public officials, municipalities ministers, charitable institutions social and fraternal clubs, and to officers, stockholders and employes of telephone companies.

The conference was attended by more than 200 telephone men.

LEGAL TELEPHONE CITATIONS

A Resume of Telephone Decisions Handed Down by the Courts.

By G. W. Hand

Appliances: Duty to furnish modern.
Richmond & Petersburg Electric Company v. Rubin, 47 S. E. 834; TELEPHONY, 8-3-226.
Necessary to provide those in general use.
Van Vechten v. N. Y. Telephone & Telegraph Company, 58 A. 1096; TELEPHONY, 9-2-159.

Assignments: Understanding that ownership of wire is to be transferred by assignment does not operate to effect such transfer in absence of compliance with method of procedure declared essential by law.
Lee v. Maryland Telephone & Telegraph Company, 55 A. 680.

Abutting Owner: Telephone line not an additional servitude in Kentucky.
Cumberland Telephone & Telegraph Company et al v. Avritt et al, 85 S. W. 204; TELEPHONY, 9-5-422.
Citing:
Pierce v. Drew, 49 Am. Rep. 7.
Julia Bldg. Assn. v. Bell Telephone Company, 57 Am. Rep. 398.
McGee v. Oversheimer (Ind.), 49 N. E. 951.
Caster v. N. W. Telephone Exchange Company (Minn.), 63 N. W. 111.
Hirchfield v. Rocky Mountain Bell Telephone Company (Mont.), 29 P. 883.
Southern Bell Telephone Company v. Francis (Ala.), 19 South 1.
Kirby v. Citizens' Telephone Company (S. D.), 97 N. W. 3.
Two rules and recent cases on rule that telephone is not additional servitude.
American Telephone Journal, 10-16-267.
Not additional servitude in Kansas—reversal of previous ruling.
McCann v. Johnson County Telephone Company, Supreme Court, Kansas, May 7, '04. TELEPHONY, 8-1-19.
Entry by company on highway as a trespasser followed by permission of land owner held to create an implied license revocable at will of land owner.
Little v. American Telephone & Telegraph Company, 89 N. Y. S. 136.
Conduit under sidewalk is not an additional servitude.
Coburn v. New Telephone Company, 156 Ind. 90.
Telephone line not an additional servitude in Michigan, 123 M. 51.
Telephone line not an additional servitude in Kansas.
McCann v. Johnson County Telephone Company, 76 Pac. 870.
Telephone line no additional servitude in city (S. D.).
Kirby v. Citizens' Telephone Company, 97 N. W. 3.
Abutting lot owner cut pole and then brought injunction to prevent company from replacing it, held could not claim right to injunction on ground of preserving status quo, he having destroyed it.
Post v. Hudson River Telephone Company, 78 N. Y. S. 576; TELEPHONY, 5-1.
Abutting owner not entitled to damages because of laying conduit in street even though he had fee to the center thereof.
Castle v. Bell Telephone Company, 13 N. Y. S. 482.
Abutting owner—right of abutting owner who does not own fee in street—removal of poles from street.
Halleran v. Bell Telephone Company, 71 N. Y. S. 685.
Abutting owners and rural highways in Ohio.
2 American Electrical Cases 237.
Fee of highway is in abutting owner—public has easement only—poles and wires are an additional servitude.
McCann v. Johnson County Telephone Company (Kan.), Pacific Reporter, later reversed and see 76 Pac. 870.
Not an additional servitude in Kansas. TELEPHONY, 8-1-19.
An additional servitude in Illinois on rural and city streets.
De Kalb County Telephone Company v. Dutton, 81 N. E. 838; TELEPHONY, 14-3-177.
Telephone poles are an additional burden in North Dakota.
Cosgriff et al v. Tri-State Telephone & Telegraph Company, 107 N. W. 525; TELEPHONY, 12-2-107.

Common Carriers: Companies are common carriers in South Carolina.
Gwynn v. Citizens' Telephone Company, 48 S. E. 460; TELEPHONY, 8-5-409.
Companies are common carriers and bound by same rules.
Hackett v. State, 105 Ind. 250; 14 Ind. App. 341.
Companies must send messenger for person wanted at station.
Central Company v. Swoveland, 14 Ind. App. 341.
Subway companies are not common carriers.
Brush Electric Company v. Consolidated Subway Company, 15 N. Y. S. 81.
Outside of its field a common carrier becomes private.
State v. Lebanon Telephone Company (Ind.).

Connections: Connections with opposite companies.
Express Cases, 117 U. S.; to 6 Sup. Ct. 542, 628.
Barney v. Steamboat Company, 67 N. Y. S. 301.
People v. Hudson River Telephone Company, 19 Abb. (N. C.) 466.
People v. Central N. Y. Telephone Company, 58 N. Y. S. 221.
Chicago & St. P. Ry Company v. Mins, 134 U. S. 418.
Railway Company v. Gill, 156 U. S. 49; 15 Sup. Ct. 484.
Shepard v. Telephone Company, 38 Hun (N. Y.) 338.
Statute prohibiting discrimination between companies.
53 N. Y. S. 574.
Contract for connections construed—mandamus.
Campbellsville Telephone Company v. Lebanon Telephone Company, 77 S. W. 1114.
Pleading in case for damages for unlawful discrimination.
Phillips v. S. W. Telegraph & Telephone Company (Ark.), 81 S. W. 605.
Willful discrimination is a breach of contract.
Cumberland Telephone & Telegraph Company v. Hudson, 71 S. W. 435.
Connections with interior systems.
Gardner v. Providence Telephone Company, 49 A. 1004.
Damages for failure to make connections.
Haber-Blum Block Hat Company v. Southern Bell Telephone & Telegraph Company (Ga.), 45 S. E. 696.
Refusal to make connections renders company liable.
Central Company v. Fehring, 146 Ind. 189.
Duty to furnish connections, enforcement by mandamus notwithstanding a previous debt.
State v. Nebraska Telephone Company, 22 N. W. 237.
Wrongful cutting off—damages.
Barton v. Cumberland Telephone and Telegraph Company, 40 S. 590; TELEPHONY 12-1-48.
Authority to connect without consent.
Western Union Telegraph Company v. Ulrich, 97 S. W. 192; TELEPHONY, 13-1-41.
Breach of contracts for.
TELEPHONY, 13-6-387.

Contracts: Duration of contract for connections.
Campbellsville Telephone Company v. Lebanon L. & L. Telephone Company, 84 S. W. 519.
Construction of for sale of telephone line.
Murphy et al v. Smith, Walker & Company et al (Tex.), 84 S. W. 678; TELEPHONY, 9-4-343.
Unnecessary to allege performance when shown that defendant has repudiated contract—suit on contract by one for whose benefit it was made, though not a party.
Foster v. Leininger, 72 N. E. 164; TELEPHONY, 9-1-33.
Duration and construction of.
Campbellsville Telephone Company v. Lebanon, Etc., Company, 77 S. W. 1114.
Interrupted service—there must be notice of, to enable subscriber to set off damages in an action for rental.
Atlantic Company v. Porter, 43 S. E. 441.
Contract by telephone, place of making.
Bank v. Sperry Flour Company, 74 Pac. 855.
Garretson v. North Atchison Bank, 47 Fed. 867.
Contracts that dissolve *quasi public* corporations void.
Cumberland Telephone & Telegraph Co. (Ind.), 127 Fed. 187.
Contract to divide profits according to expenses not void as being against public policy.
9 Abb. (N. C.) 214.
A company cannot contract against its own negligent acts.
Telephone Company v. Swoveland, 142 Ind. App. 341.
Vendor who operates under predecessors' franchises bound by their obligations, not so for their torts unless torts have been placed in judgment.
Mahan v. Michigan Telephone Company, 93 N. W. 629.
Rewards—cutting wires—contract to pay for.

South Western Telephone Company v. Priest, 72 S. W. 241.

Contract ratified where company used a plant which it had bought, though could show no authority of president to make.

Badger Telephone Company v. Wolf River Telephone Company, 97 N. W. 907.

Contract that cannot be assigned, act of selling business puts an end to contract.

Sullivan v. Chicago Board of Trade; TELEPHONY, 9-1-34.

Construction of contract and duration of same, not determinable at will of either.

Campbellsville Telephone Company v. Lebanon L. & L. Telephone Company, 80 S. W. 114; TELEPHONY, 8-5-408.

Construction of—statute of frauds—contract only signed by one party—sale of stock part of contract of subscription.

Co-operative Telephone Company v. Katus (M.), 12 D. L. N. 187; TELEPHONY, 10-71.

To give telephone service for privilege of placing poles on premises valid.

Anderson v. Mt. Sterling Telephone Company et al., 86 S. W. 1119; TELEPHONY, 10-2-175.

With subscriber. Relation is that of landlord and tenant.

Query. American Telephone Journal, 10-3-41.

Unnecessary to allege performance where shown that defendant has repudiated it.

Suit on contract by one for whose benefit it was made, though not a party.

Foster v. Leminger, 72 N. E. 164; TELEPHONY, 9-1-33.

Company bound with original contract with city.

People ex rel Chicago v. Chicago Telephone Company, 77 N. E. 245; TELEPHONY, 11-6-399.

Contract between parties in different counties made in county where to be performed.

Bank of Yazoo v. Sperry Flour Co., 65 L. R. A. 90; TELEPHONY, 11-2-83.

Contract to telephone company for water purposes gave right to do commercial business.

65 A. 747; TELEPHONY, 13-5-303.

Construction of question of intention of company.

33 Pa. Super. Ct. 230; TELEPHONY, 14-5-307.

Message from Indiana to be delivered in Kentucky.

Western Union Telegraph Company v. Lacer, 93 Su. 34; TELEPHONY, 12-2-106.

Corporations: Grant to incomplete corporation, not void.

Chicago Telephone Company v. North Western Telephone Company, 199 Ill. 324.

Consolidation of corporations—compliance with law.

Cum. & Company v. Morgans Company, 36 South 352.

Foreign in Pennsylvania, requisites to doing business.

Kilgore v. Smith, 122 Pa. St. 48.

Commonwealth v. Oil Company, 101 Pa. St. 119.

Director is an officer.

Eastman v. New York State Telephone Company, 83 N. Y. S. 1010.

Power to employ counsel—act of president of corporation binds corporation—remedy against president, action in damages.

Fernald v. Spokane & British Columbia Telephone & Telegraph Company, 72 Pac. 462.

Individual may complete incorporation under an act forbidding it by corporations.

Haines v. Crowley, 47 A. 137.

Corporations cannot sell out unless franchise and ordinance provide for such sale.

Cumberland Telephone Company v. City of Evansville, 1903, Federal Court of Indiana.

Illegal incorporation by committee of subscribers. Majority of subscribers having repudiated their action.

Mt. Carmel Telephone Company v. Mt. Carmel & Flemingsburg Telephone Company, 84 S. W. 515; TELEPHONY, 10-5-353.

Crossings: Insulation required at.

Hebert v. Lake Charles Ice, Light & Waterworks Company, 35 South 731.

Railroad right of way.

St. Louis & C. R. Company v. Postal Telegraph Company, 51 N. E. 382.

The relation between telegraphs and telephones.

55 Central Law Journal 6.

Public and private rights of way in New York—additional burden to rural highway.

Eels v. American Telephone & Telegraph Company, 38 N. E. 202.

One telephone line with another.

95 N. W. 460.

65 N. E. 329.

Telephone company crossing railroad track—its right to do so—guard wires—cross-arms.

American Telephone Journal, 9-9-137.

Damages: "Liquidated damages" and "penalty," distinction between guaranty fund declared forfeited.

City of Detroit v. People's Telephone Company, 10 Det. Legal News, 935; TELEPHONY, 7-5-355.

Measure of damages in Texas.

St. Louis Southwestern Railway Company v. Hughes, 73 S. W. 976; TELEPHONY, 6-1-31.

Damages for failure to transmit messages—penalty applies to written messages only.

Cumberland Telephone & Telegraph Company v. Saunders, 35 South 653.

Check deposited as guaranty to build in certain time, held liquidated damages.

Detroit v. People's Telephone Company, 101 M. 935.

For failure to deliver messages, governed by laws of state where to be delivered.

Hughes v. Western Union Telegraph Company, 52 S. E. 107; TELEPHONY, 11-2-84.

Meaning of "dispatch."

Pollard v. Missouri & Kansas Telephone Co., 90 S. W. 121; TELEPHONY, 11-4-214.

Hearsay evidence to prove, not admissible.

Cumberland Company v. Hicks, 42 Southern 285; TELEPHONY, 13-2-113.

Discrimination: Rule where subscriber lives outside jurisdiction of company's business.

Crouch v. Arnelt et al (Kan.), 79 P. 1086; TELEPHONY, 10-1-72.

Electricity: Companies are bound to exercise high degree of care in use of.

Norfolk Railway & Light Company v. Sprately, 49 S. E. 502; TELEPHONY, 9-4-343.

Lineman injured by electric light wire.

Barto v. Iowa Telephone Company, 101 N. W. 876.

Care required by those handling electricity—Rule in Connecticut, McAdam v. Central Railway & Electric Company, 35 A. 341; TELEPHONY, 10-6-418.

Injury caused by children throwing broken telephone wires over electric light wire.

Star v. Muskegon Traction & Lighting Company, 12 D. L. N. 550; TELEPHONY, 10-6-418.

Incompetency of servant in use of as ground of liability.

Scott v. Iowa Telephone Company, 102 N. W. 432; TELEPHONY, 10-6-419.

Injury from, to one not in employ of company.

Morgan v. Hudson River Telephone Company, 100 N. Y. S. 539; TELEPHONY, 6-12-360.

Lineman injured by electric light wire.

Barto v. Iowa Telephone Company, 101 N. W. 876.

Failure to make insulation test, bar to recovery, 38 A. 888; TELEPHONY, 11-6-399.

What is reasonable care? Georgia rule.

53 S. E. 111; TELEPHONY, 11-6-399.

Same. North Carolina rule.

TELEPHONY, 12-1-49.

Servant aware of danger—no liability.

77 N. E. 716; TELEPHONY, 12-1-49.

Due care—Oregon rule.

Carroll v. Gran Roude Electric Company, 84 Pacific 389; TELEPHONY, 12-3-181

Same—Florida rule.

Jacksonville Electric Company v. Slavan, 42 Southern 576; TELEPHONY, 13-3-161.

Fireman takes his own chances from dangers of charged wires.

TELEPHONY, 13-5-303.

Lightning brought in over telephone wires.

Evans v. Eastern Kentucky Company, 99 S. W. 936; TELEPHONY, 13-5-303.

Eminent Domain: Companies have right of eminent domain in Georgia—easement—damages.

TELEPHONY, 8-3-226.

Rule that property cannot be taken without just compensation does not extend to exercise of police power in a lawful manner (Tex.).

Houston T. C. Railway Company v. City of Dallas, 84 S. W. 648; TELEPHONY, 9-4-343.

Eminent domain is conferred upon companies by statute in South Carolina.

South Carolina & G. R. Company v. American Telephone & Telegraph Company, 43 S. E. 970; TELEPHONY, 6-3-162

Jury's estimate in condemnation proceedings not necessarily conclusive in Louisiana.

Texas & Pacific Railway Company v. Southern Development Company, 27 South 101; TELEPHONY, 8-6-521.

Companies cannot assert right of eminent domain in Pennsylvania.

TELEPHONY, 7-4-249.

Rights acquired in condemnation proceedings in Kansas.

Missouri, Kansas & North Western Railway Company v. Schmuck, 76 Pac. 836; TELEPHONY, 8-3-225.

Title of eminent domain only an easement in Colorado.

Union Pacific Railway Company v. Colorado Postal Tele-

graph Cable Company, 69 Pac. 564; TELEPHONY, 6-3-162.

Companies may exercise right of eminent domain in Ohio.
Cleveland Railroad Company v. Ohio Postal Company, 67 N. E. 892; TELEPHONY, 6-3-162.

Discussion of question of eminent domain in relation to telephone companies in West Virginia.
Maxwell v. Central District & Printing Telegraph Company, 41 S. E. 125; TELEPHONY, 6-2-88.

Companies must first endeavor to settle disputes, else courts will enjoin condemnation proceedings in Georgia.
City of Ellerton v. Hobbs, 49 S. E. 780; TELEPHONY, 9-4-342.

Eminent domain in Arkansas—right of.
St. Louis & San Francisco Railroad Company v. Southern Telegraph & Telephone Company, 121 Fed 276; TELEPHONY, 6-1-31.

Right to lay gas pipes does not include right to erect telephone line.
Woods v. Greensboro Natural Gas Company, 54 A. 470; TELEPHONY, 5-6-337.

Companies do not possess right of, in Pennsylvania.
Pennsylvania Telephone Company v. Hoover, 58 A. 922.

Condemnation proceedings—meaning of "right of way"—statute construed.
South Carolina & G. R. Company v. American Telephone & Telegraph Company, 43 S. E. 970.

Expropriating a right of way—Louisiana law constitutional—insufficiency of award.
Southwestern Telephone Company v. K. S. S. & G. Railway Company, 33 South 910.

State, superior to consent of village authority—New York.
New Union Telephone Company v. Marsh, 89 N. Y. S. 79; TELEPHONY, 11-5-301.

Ultra wires—corporate powers—power to operate a gas company does not give power to operate a telephone line.
Woods v. Greenburg National Gas Company, 54 A. 470.

Condemning easement along railroad right of way.
St. Louis & San Francisco Railroad Company v. S. W. Telephone & Telegraph Company, 121 Fed. 276.

Presumption as to purpose of.
Central of Georgia Ry. Company v. Union Springs Ry. Company, 39 Southern 473; TELEPHONY, 11-2-84.

Right of one corporation having power of eminent domain to condemn land of another corporation having such right, is limited.—Virginia.
Great Falls Power Company v. Great Falls Dominion Railway Company, 52 S. E. 172; TELEPHONY, 11-3-147.

North Carolina companies must compensate abutting owners.
Brown v. Asheville Electric Light Company; TELEPHONY, 11-4-215.

Telephone companies have not right of.
Alabama & Vicksburg Railway Company v. Cumberland Telegraph & Telephone Company, et al, 41 Southern 258; TELEPHONY, 12-3-181.

Acquiring right of way on railroads—in this state (Missouri) companies have the right of.
American Telephone & Telegraph Company v. St. Louis, Iron Mountain & Southern Railway Company, 101 S. W. 576; TELEPHONY, 14-2-70.

In Mississippi companies have the right of, on railroads.
Cumberland Telephone & Telegraph Company v. Yazoo & Mississippi Valley Railroad Company, 44 Southern 166; TELEPHONY, 14-3-175.

Power to operate a gas company does not give power to operate a telephone line—corporate powers—ultra vires.

Condemnation of easement along railroad right of way.
St. Louis & San Francisco Railroad Company, v. South Western Telegraph and Telephone Company, 121 Fed. 276.

Construction of statute "along and parallel to any of the railroads in the city."
S. W. Telephone Company v. K. C. Company, 33 South 910.

Condemnation of mineral land, rule as to measure of damages.
Missouri, K. & N. W. Company v. Schmuck (Kan.), 76 Pac. 836.

Condemnation of right of way over railroad—jury.
Cumberland Telephone & Telegraph Company v. Morgan's Company (111 La.), 36 South 352.

Corporations have right to jury trial in condemnation proceedings.
City of St. Louis v. Roe et al. (Mo.), 83 S. W., 435; TELEPHONY, 9-2-160.

In California—value of fee and easement.
Southern Pacific Railroad Company v. San Francisco Company et al., 79 P. 961; TELEPHONY, 10-1-71.

In West Virginia—word "companies" in a statute includes individuals—no additional servitude in this state—no distinction between city and rural highways.
Louther v. Bridgeman, 50 S. E. 410; TELEPHONY, 10-4-282.

Companies are not authorized to take private property by, in Pennsylvania.
Pennsylvania Telephone Company v. Hoover, 58 A. 922; TELEPHONY, 8-6-522.

Measure of damages in condemnation proceedings in Texas.
Lettegast v. Houston O. L. & M. Railway Company, 87 S. W. 197; TELEPHONY, 10-4-284.

Eminent domain (Iowa). Public use means such use as will inure to the benefit of the parties concerned, as members of the community.
Sisson v. Board of Supervisors, 104 N. W. 454; TELEPHONY, 10-5-353.

No exclusive franchise for use of streets in Alabama.
Montgomery Light & Water Power Company v. Citizens' Light, Heat & Power Company, 38 So. 1026; TELEPHONY, 10-5-354.

Evidence: Telephone conversations are admissible in evidence.
McCarthy v. Peach, 70 N. E. 1029; TELEPHONY, 8-2-123.

Contract made over telephone is made where person is who accepts offer.
Bank of Yolo v. Sperry Flour Company, 74 Pac. 855; TELEPHONY, 8-3-226.

Admissibility of conversations over telephone.
Lillie v. State, 100 N. W. 320; TELEPHONY, 8-4-328.

Communications over telephone as evidence.
Globe Printing Company v. Stahl, 23 Mo. App. 451; TELEPHONY, 6-3-163.

Charges for expert opinion.
Rosewater v. Glenn Telephone Company, 80 N. Y. S. 880; TELEPHONY, 5-5-286.

Evidence of condition of wire months afterward not competent in case of alleged negligence.
Hannum v. Hill (W. Va.), 43 S. E. 223.

Number of witnesses as bearing on preponderance of.
Campbell v. Delaware & Atlantic Telephone & Telegraph Company, 56 A. 303.

Identity of party must be established before conversation over telephone can be admitted.
Young v. Pacific Transfer Company (Wash.).

Runaway caused by poles lying by roadway—expert testimony.
Missouri & Kansas Telephone Company v. Vadevort, 14 Am. Neg. Rep. 291.

Number of witnesses does not constitute preponderance.
Campbell v. Delaware & Atlantic Company, 56 A. 303.

Testimony of condition after accident.
TELEPHONY, 11-3-148.

Conversations—admissible in Illinois though witness does not know voice.
Godair et al. v. Ham National Bank, 80 N. E. 407; TELEPHONY, 13-5-303.

Same, bind defendant in criminal cases.
State v. Usher, 111 N. W. 811; TELEPHONY, 14-1-11.

Same, what a bystander heard one of the parties say is admissible in Missouri.
Edge v. Southern Missouri Electric Railway Company, 104 S. W. 90; TELEPHONY, 14-4-231.

Telephone conversations to be used in evidence, must know party's voice.
Dunham v. McMichael, 63 A. 1007; TELEPHONY, 12-4-239.

Admissibility of telephone conversations dependent on question whether witness is acquainted with party's voice.
Swing v. Walker, 27 Pa. Superior Court 366; TELEPHONY, 11-3-148.

Telephone conversations as—hearsay rule applies.
Duvall v. Ferwerda, 13 D. L. N. 659 (M.); TELEPHONY; 13-1-41.

Telephone conversations as—party bound who stood by and approved of statements made over telephone.
Pittsburg & Ohio Mining Company v. Scully, 13 D. L. N. (Mich.) 476; TELEPHONY, 12-4-239.

Ejectment: Ouster of company from highway.
Little v. American Telephone & Telegraph Company, 89 N. Y. S. 136; TELEPHONY, 9-1-34.

Wire over land of another—ejectment will lie.
Butler v. Frontier Telephone Company, 79 N. E. 716; TELEPHONY, 13-3-160.

Forfeiture of Charter: What misuses will work—legality of purchasing competing companies.
State v. Cumberland Telephone & Telegraph Company, 86 S. W. 390; TELEPHONY, 10-4-283.

Franchise: Passed at special meeting of trustees, invalid.
Rough River Telephone Company v. Cumberland Telephone & Telegraph Company, 84 S. W. 517.

Void sale of—no provision for sale in ordinance.
Cumberland Telephone & Telegraph Company v. City of Evansville, 127 Fed. 187.

Company given permission by resolution to enter village, latter could not thereafter deny company to do business.
Village of London Mills et al. v. White et al., 70 N. E. 31.

Sale of franchise in Wisconsin.

Badger Telephone Company v. Wolfe River Telephone Company, 97 N. W. 907; TELEPHONY, 8-1-19.
Franchise can only be declared void by competent court.
City of Fremont v. Nebraska Telephone Company; TELEPHONY, 8-1-18.
Attempt to annul ordinance, construction of statutes.
Old Colony Trust Company v. City of Wichita, 123 Fed. 762; TELEPHONY, 6-4-242.
Exclusive franchise—injunction.
Cumberland Telephone & Telegraph Company v. Home Telephone Company, 72 S. W. 4; TELEPHONY, 5-4-211.
Exclusive franchise against public policy.
Muskogee National Telephone Company v. Hall et al., 118 Fed. 382; TELEPHONY, 5-3-155.
Free service to city, validity of.
New Williams v. Great Southern Telephone & Telegraph Company, 40 Am. Elec. Cases 122.
A contract without consideration where state law gives right to erect lines.
Macklin v. Home Telephone Company, 24 O. Cir. Ct. R. 446.
Termination of, by city.
City of Wichita v. Old Colony Trust Company, 132 Fed. 641; TELEPHONY, 9-1-33.
Exclusive franchise.
Pensacola Telephone Company v. Western Union Telegraph Company, 96 U. S. 1.
Creek nation has no right to grant exclusive franchise because it would obstruct interstate commerce.
Muskogee National Telephone Company v. Hall, 118 Fed. 382.
Franchise granted by county must be recognized by town subsequently incorporated.
38 Vt. 193; 100 U. S. 514.
Difference between franchise and revocable license.
Boston Electric Light Company v. Boston Terminal Company (Mass.).
Franchise or license assignable.
People v. Central Union Telephone Company, 61 N. E. 428.
Exclusive franchise—sale to highest bidder.
47 S. W. 959; 121 M. 513; Joyce on Electric Law, p. 189; 3 Am. Elec. Cases 72.
Discussion of question of exclusive franchise in Alabama.
American Telephone & Telegraph Company v. Morgan County Telephone Company, 36 South 178.
When city is estopped to question authority to grant.
Village of London Mills v. White, 70 N. E. 313.
Validity of franchise—not sustained where granted at same meeting that it was introduced.
Maraman v. Ohio Valley Telephone Company, 79 S. W. 398.
Private citizen cannot maintain injunction to annul franchise of company.
Clark v. Interstate Telephone Company, 101 N. W. 977; TELEPHONY, 9-3-254.
Council may grant more favorable franchise to one company than to another.
American Telephone Journal, 9-3-42.
Sale of, in Wisconsin.
Badger Telephone Company v. Wolf River Telephone Company, 97 N. W. 907; TELEPHONY, 8-1-19.
Exclusive.
American Telephone & Telegraph Company v. Morgan County Telephone Company (Ala.), 36 S. 178.
Authority of telephone company to do electric lighting business in Maryland, consent of city.
Brown v. Maryland Telephone & Telegraph Company, 61 A. 338; TELEPHONY, 10-4-284.
Agreement to transfer ultra vires and void except in Wisconsin and Michigan. Query.
American Telephone Journal, 10-25-417.
Use of streets in Missouri for telephone poles is a legal one, but a money charge for the right may be imposed.
City of Lancaster v. Briggs, 96 S. W. 314; TELEPHONY, 12-5-200.
Authority of telephone company to do electric lighting business in Maryland—consent of city.
Brown v. Maryland Telephone and Telegraph Company, 61 A. 338; TELEPHONY, 10-4-284.
Authority to "erect poles and wires" includes authority to change to conduit system.—Pennsylvania.
Alleghany County Light Company v. Booth et al., 66 Atlantic 72; TELEPHONY, 14-2-71.
Company failed to prove its authority to do business and was denied right to defend suit in Missouri.
Cartwright et al. v. Liberty Telephone Company, 103 S. W. 982; TELEPHONY, 14-4-231.
Sale of—in Michigan company owning franchise may sell without permission by municipality.
Michigan Telephone Company v. St. Joseph, 121 M. 502; TELEPHONY, 14-5-307.
Individual permission of each, across whose lands lines are to be run, must be obtained from Tonawanda nation of Seneca Indians.—New York.
Jemison v. Bell Telephone Company, 79 N. E. 728; TELEPHONY, 14-5-306.

Injunction: By company against employe's wife calling up over company telephone.
TELEPHONY, 11-3-148.

Interference: Distance wires of different companies may lawfully be placed from each other.
Northern Telephone Company v. Iowa Telephone Company, 98 N. W. 113; TELEPHONY, 7-6-438.
Cutting dead wires not an interference with the transmission of messages.
South Western Telegraph & Telephone Company v. Priest et al., 72 S. W. 241; TELEPHONY, 5-5-286.
Wire over building—proper method of construction.
Chicago Telephone Company v. North Western Telephone Company, 65 N. E. 329.
Under building, company held to have exclusive right—injunction.
Northwestern Telephone Exchange Company v. Twin City Telephone Company (Minn.), 95 N. W. 460.
Right of injunction by first occupant.
Nebraska Telephone Company v. York Lighting Company, 43 N. W. 126.
Distance between adjacent wires.
Northern Telephone Company v. Iowa Telephone Company, 98 N. W. 113.
Damages from conduction.
Wisconsin Telephone Company v. Street Railway, 3 American Electrical Cases 383.
Interference with subways.
North Western Telephone Company v. Electric Light & Power Company (N. Y.) 70 N. E. 866.
Interference with street railway and telephone lines—guard wires.
Richmond Electric Railway Company v. Rubin, 47 S. E. 634.
Interference, telephone wires and electric light wires.
Northwestern Telegraph Company v. Guernsey & Scudder Electric Light Company, 46 Mo. App. 120; 3 Am. Elec. Cases 425.
Paris Electric Light & Railway Company v. South Western Telegraph & Telephone Company, 5 Am. Elec. Cases 262; Jones, Electric Law, p. 517.
Telephone line by railroad.
Railway Company v. European Electric Printing Telegraph Company, 9 Exchange 363.
Allen's Telegraph Cases 8.
South Western Telegraph & Telephone Company, 27 S. W. 38.
Gross v. South Chicago City Railway Company, 73 Ill. App. 217.
Joyce, Electric Law 419.
Conduction, induction and contact—rights of street railway and telephone company.
Hudson River Telephone Company v. Railway Company, 135 N. Y. 393; 4 American Electrical Cases 276.
State ex rel. v. Railway Company, 87 Wis. 72; 4 American Electrical Cases 289.
Cumberland Telegraph & Telephone Company v. United Electric Railway Company, 93 Tenn. 492; 4 American Electrical Cases 297.

Legislative Control: Cannot maintain injunction for trespass not threatened.
Sunset Telephone & Telegraph Company v. City of Eureka et al., 122 Fed. 960; TELEPHONY, 6-4-241.
Municipal regulation and control of telephone and telegraph companies.
56 Central Law Journal 125.
Control by legislation—all appliances used by companies that are devoted to public use, subject to.
Hackett v. State, 105 Ind. 250.
Power of municipality to prescribe painting of poles and color.
American Telephone Journal, 9-25-393.
What nuisances will work forfeiture of charter.
State v. Cumberland Telephone & Telegraph Company, 86 S. W. 390; TELEPHONY, 10-4-283.
Necessity of franchise—use of streets in Minnesota.
Northwestern Exchange Company v. City of St. Charles, 154 Federal 386; TELEPHONY, 14-6-349.

Limitation: Statute of limitations barred right of action for deceased's death.
Poff v. New England Telephone & Telegraph Company (N. H.), 55 A. 891.

License: License fees—rule when valid.
Norfolk & Western Railway Company v. Town of Suffolk, 49 S. E. 658; TELEPHONY, 9-4-343.
Pole rental for use of streets.

City of Pensacola v. Southern Bell Telephone Company, 37 South, 820; TELEPHONY, 9-4-343, and cases cited
City of Allentown v. Western Union Telegraph Company, 23 A. 1070.
City of Philadelphia v. Atlantic & Pacific Telephone Company, 102 Fed. 254.
City of Philadelphia v. Postal Telegraph Company, 21 N. Y. Supp. 556.
Western Union Telegraph Company v. Borough of New Hope, 187 U. S. 419.
Not a vested right.
Radfield Telephone & Telegraph Company v. Cyc, 49 A. 1047.
To place wires on buildings is terminated by transfer of property.
TELEPHONY, 11-4-215.
To trim trees in New York.
TELEPHONY, 11-4-215.

License tax on poles in Pennsylvania:
Louise Merion Twp. v. Postal Telegraph Cable Company, 25 Pa. Sup. Court 306; TELEPHONY, 10-1-72.
In Wisconsin such fees cannot be collected if amount assessed is greater than expense of police regulation.
Wisconsin Telephone Company v. City of Milwaukee, 104 N. W. 1009; TELEPHONY, 11-2-84.

Master and Servant: Fellow servant—duty to furnish proper tools cannot be delegated to fellow servant.
Orr v. Southern Bell Telephone & Telegraph Company, 44 S. E. 401.

Mandamus: Does not lie to compel installation of telephone in disorderly house.
Godwin v. Carolina Telephone Company, 48 S. E. 636.
To compel company to place telephone which has been before raided as a pool room; TELEPHONY, 10-2-175.
May be used to compel connections.
Telephone Company v. State, 118 Ind. 191; 123 Ind. 113.
Cannot be used to force company to install phone in place which had been used as a pool room.
TELEPHONY, 10-2-175.

Mortgages: After—acquired property, former covered latter (N. J.).
Monmouth County Electric Company v. Central Railway Company, 54 A. 10.

Negligence: Actionable negligence exists only when company owes injured party some duty.
Cumberland Telegraph & Telephone Company v. Martin's Admr., 63 L. R. A. 469; TELEPHONY, 8-5-408.
Incompetency of servant—duty of master—knowledge by company—what is reasonable care.
Scott v. Iowa Telephone Company, 102 N. W. 432; TELEPHONY, 9-4-343.
Insulation of wires—Kentucky rule—perfect protection.
Paducah Railway & Light Company v. Bell's Admr., 85 S. W. 216; TELEPHONY, 9-5-421.
Injury to lineman—inspection of poles not required in United States Court of Appeals (Sixth Circuit).
Britton v. Central Union Telephone Company, 131 Fed. 846; TELEPHONY, 8-6-522.
Liable for acts of messenger—rules, promulgation of.
Central Union Telephone Company v. Swoveland, 42 N. E. 1035; TELEPHONY, 7-6-439.
Wire attached to chimney—injury to passerby—proximate cause.
Leeds v. New York Telephone Company, 70 N. E. 219; TELEPHONY, 7-6-438.
Duty to furnish reasonably safe place to work.
Harp v. Cumberland Telegraph & Telephone Company, 80 S. W. 510; TELEPHONY, 8-2-121.
Proximate cause.
Cumberland Telephone & Telegraph Company v. Ware's Admrx., 74 S. W. 289; TELEPHONY, 6-1-30.
Want of due care in taking down telephone poles.
Kyes v. Valley Telephone Company, 93 N. W. 623; TELEPHONY, 5-6-336.
Notice a bar to recovery.
Leach v. Central N. Y. Telephone & Telegraph Company, 80 N. Y. S. 1037; TELEPHONY, 5-5-286.
What is "ordinary care"?
Cumberland Telephone & Telegraph Company v. Warner, 79 S. W. 199; TELEPHONY, 8-3-225.
Failure to provide reasonably safe place to work.
Walsh v. New York & I. C. Railway Company, 80 N. Y. S. 767; TELEPHONY, 5-5-286.
Pole an appliance, not a place.
Britton v. Central Union Telephone Company, 131 Fed. 846.
Where omission of duty was concurrent, telephone and traction companies were not improperly joined as defendants.
Graves v. City Association, 132 Fed. 387.
Negligence in delivering messages—telegraph and telephone companies are under same duty when they hold themselves out to public that they deliver messages.
Martin v. Sunset Company, 51 Pac. 376; 18 Wash. 260.
Liability for damages from lightning.
63 L. R. A. 219.
Failure to insulate wires that afterward fell on highway—knowledge by person injured of dangerous condition.
Parsons v. Charleston Consolidated Railway Company (S. C.), 48 S. E. 284.
Obstruction of highway by sagging wire—knowledge of dangerous condition by person injured.
Smith v. Gilreath (S. C.), 48 S. E. 262.
Negligence causing loss of stock of goods by fire due to contact of wire with building.
Richmond Electric Railway Company v. Rubin, 47 S. E. 834.
Fact that employe knew of live wires does not affect his right of recovery where he was informed that the wires were properly insulated—proximate cause for the jury.
Hamworth v. Mineral Belt Telephone Company (Mo.), 79 S. W. 727.
Not contributory negligence to rescue a fellow workman and rescuer may recover *if injured under certain conditions.*
Whitworth v. Shreveport Belt Railway Company (112 La.), 36 South, 414.
Servant injured by explosion of dynamite in post hole—fellow servant.
Harp v. Cumberland Telephone Company (Ky.), 80 S. W. 210.
Injury caused by horse running into pole which was near highway.
Alice, Wade City, Etc., Company v. Billingsley, 77 S. W. 255.
Damages sustained from defective crossings recoverable—excessive damages reduced.
Herbert v. Lake Charles Company, 35 South. 731.
Degree of care—"skillful," as well as "ordinarily prudent," proper in telephone business.
Cumberland Telephone & Telegraph Company v. Warner, 79 S. W. 199.
Negligence—two principles in personal injury case.
Shapura v. National Sugar Refining Company, 81 N. Y. S. 1085; TELEPHONY, 6-2-88.
Contributory negligence of—plaintiff had seen fallen wire, but defendant held not guilty of.
West Kentucky Company v. Pharis, 78 S. W. 917.
Pole broken by runaway horse—company had right of action against owner of horse.
21 (Hun. N. Y.) 22.
Liability for breaking electric wires—between parties having no contract relation with each other.
117 Ga. 191; 17 Harvard Law Review 288; 10 Detroit Legal News 47.
Liability for failure to insulate wires.
Parsons v. Charleston Consolidated Gas & Electric Company; 48 S. E. 248; TELEPHONY, 9-1-248.
Question for jury whether company was negligent in not guarding its wires.
Burton Company v. Gordon, 25 Ohio Circuit Court Reports 641; TELEPHONY, 9-1-34.
Telephone and traction company jointly charged with liability—liability of parties.
Graves v. City and Suburban Association, 132 Fed. 387; TELEPHONY, 9-1-34.
Injury caused by falling over loose wire.
Texas & Pacific Telephone Company v. Prince, 82 S. W. 327; TELEPHONY, 9-2-161.
Injury caused by electric wiring conveyed over defective telephone apparatus.
Lynchburg Telephone Company v. Bokker, 50 S. E. 148; TELEPHONY, 9-6-518.
Defects at other times and places do not prove a defect at particular place.
United Electric Light & Power Company v. State to use of Lisby, et al, Court of Appeals of Maryland, 60 A., 248 TELEPHONY, 9-6-518.
Where there is no duty to warn of danger there is no liability in case of injury.
Rowe v. Taylorville Electric Company, Supreme Court of Illinois, 72 N. E. 711.
Lineman thrown from pole by bicylist—construction of rule that "linemen shall furnish tools."
Hyland v. Southern Bell Telephone & Telegraph Company, 49 S. E. 879; TELEPHONY, 10-1-71.
Degree of care—defective insulation.
Winkleman v. Kansas Electric Light Company, 85 S. W. 99; TELEPHONY, 10-1-72.
Fellow servant rule in South Carolina—constitutional provision.
Brablam v. American Telephone & Telegraph Company, 50 S. E. 716; TELEPHONY, 10-2-175.

(Concluded in June Telephony.)

MODERN TOLL SWITCHBOARD EQUIPMENT

The Continuation of a Series of Articles Dealing with this Important Subject

By J. E. Hilbish, J. B. Thiess and G. A. Joy

ARTICLE VIII.

THE discussion of toll switchboard apparatus in this series has advanced to the extent that a further elucidation of matters purely telephonic, with the exception of phantom work, would be more or less of a repetition and hence for our purpose superfluous, and we shall consequently devote our attention in the work to follow, to matters in which we find a combination of the telephone and telegraph. When the telephone companies first entered the field of long distance work they found that the expense of erecting and maintaining long distance lines was very great, and consequently that the rates which had to be charged, to obtain a fair return on the capital invested, were correspondingly large. This condition was true as has been said when the first attempt at long distance work was made, and, as the art progressed, and the distance over which it was possible to converse was correspondingly increased, the cost of the line equipment was felt to a still greater extent, and exchange managers began looking around for some method of obtaining revenue from their lines when they

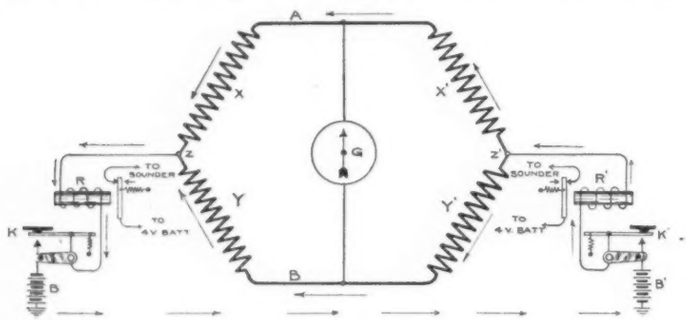


Figure 25—Theory of phantom transmission circuits.

were idle, or even while they were being used for telephonic conversations.

It was but natural that in looking for a solution of the problem a combination of the telephone and telegraph should suggest itself, and it was along these lines that relief was sought, and from a very crude start this idea has been elaborated upon until at the present time we find that we have some very elaborate systems and complicated problems to face. The systems devised are usually divided into three classes, i. e., simplex, in which one pair of wires can be used for the simultaneous sending of one telephone and one telegraph message; composite, using one pair of wires for the simultaneous sending of two telegraph and one telephone message, and phantom, which is a combination of apparatus and lines, which in its simplest form permits the transmission of three telephone messages over two pair of wires simultaneously.

Before going into a detailed description of any of the above systems we shall try to show the use that the telephone company can make of these combinations in order to enhance the revenue obtained from their lines. When the telephone company is situated in a city in which business is keen and extensive, they can very often lease their telephone lines for telegraphic work to brokers, newspapers, etc., for certain periods of the day. Thus a certain broker may want telegraph communication with another town for a certain definite and specified time each day, and under these conditions he will usually make a contract with the telephone company, leasing by the month the line for that certain period. Then again, if this business is not great enough to keep the telegraph lines busy a telephone company will very often use the same for ordering up telephone connections and thus relieve the telephone circuits of this burden, thereby working the latter at the greatest possible efficiency.

A STANDARD CIRCUIT.

In starting our discussion of the regular simplex circuit we thought it expedient to first show a skeleton theoretical circuit of the scheme utilized in accomplishing the desired result. This circuit is depicted in Figure 25, and it will be readily observed that the physical law taken advantage of, which is used to a great extent in all telephone and telegraph work, is the Wheatstone bridge principle.. Only the telegraph circuit is shown in this sketch, the regular operator's equipment such as a key, relay, etc., being shown at each end of the circuit. These telegraph circuits, as will be noted, form the battery feed of our Wheatstone bridge, while coils X, Y, X^1 and Y^1 are the four arms of the bridge. Leads A and B are the line wires, and since for all practical purposes the resistance of these wires can be kept close enough to prevent any very perceptible unbalance we find that a galvanometer placed as shown will indicate a bal-

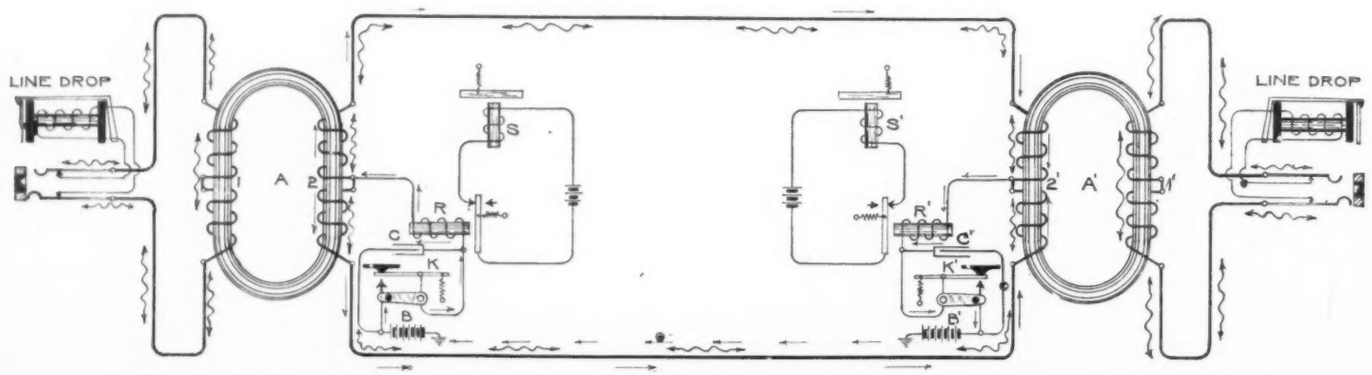


Figure 26—Repeating coils between switchboard terminals and line circuits with telegraph circuit operating phantom.

anced condition, that is, that points on the line wires practically equally distant from the exchange will be at an equal potential and consequently no flow of current will be obtained through the galvanometer. Therefore, when keys K and K^1 are closed, a current will flow from battery B^1 through the key contact and relay R^1 to Z^1. At this point the current divides, half of it taking the upper arm and the other half the lower arm of the bridge to point Z, at which junction the current reunites and flows by way of relay R, the key and battery B to ground and hence back to battery B^1. The path of the current can be readily traced with the aid of the arrows on the sketch.

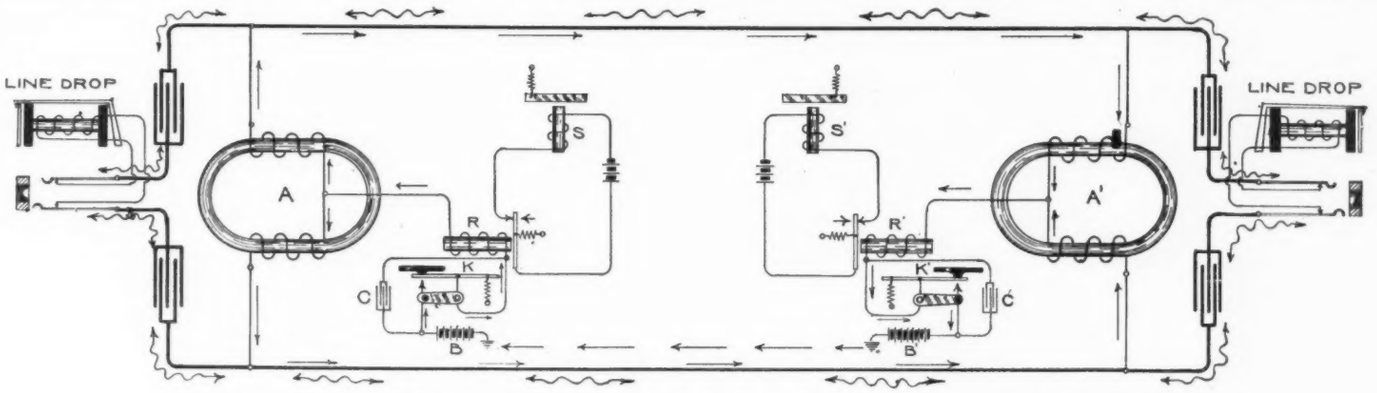


Figure 27—Combined telephone and telegraph circuit with switch- board terminals connected through condensers.

SIMPLEX CIRCUIT, USING REPEATING COIL METHOD.

We are now ready to adapt the above conditions to a telephone line and we refer the reader to Figure 26 for a standard simplex system in which the use of the repeating coil method is made. It will be noted that the telephone jack is wired direct to one winding of a repeating coil, the other winding being carried to the line wires, and consequently our telephone talking circuit is identical with that ordinarily used in toll work in which a ground and metallic, or a common battery and local battery circuit is connected. The telegraph circuit is connected to the middle point of winding 2 and 2^1 of the repeating coils A and A^1, and thereby the Wheatstone circuit is established and consequently the toll

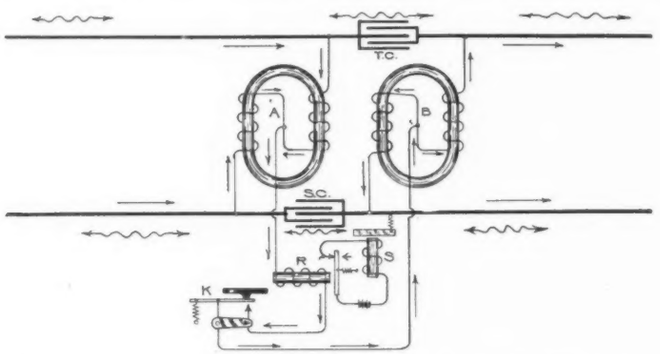


Figure 28—An intermediate telegraph station on a through toll circuit.

circuit is at all times balanced as regards the telegraph current. It should further be noted that the additional resistance inserted into the telegraph circuit due to the winding of the repeating coils is quite immaterial since the two line wires are worked in parallel and consequently the line resistance is cut in two, and furthermore, since the telegraph circuit is tapped to the middle of the repeating coil winding, the current will flow from the center to each end and thus these two halves of the coil will act as a non-inductive resistance, since the induction of one-half counteracts that of the other, thereby making the mutual induction zero. It will be observed that each telegraph key is shunted with a condenser, the object of which is to reduce the heavy surges and fluctuations of potential in the line and take up the spark at the key contact. Thus when the telegraph circuit is broken the magnetic energy stored in the relay, coils and circuit is absorbed by the condenser, the same acting as a sort of reservoir, from which it is gradually dissipated, or if the contact is closed immediately, it is to a certain extent gradually restored to the circuit, instead, as would be the case if this condenser were omitted, of this stored energy all being absorbed instantaneously in the spark at the key contact which would be very liable to cause fluctuations of potential on the line. This naturally causes a considerable saving of wear and tear of key contacts, and gives rise to a smoother working of the apparatus. It might be well to state that it is also common practice to shunt the relay as well as the key contact with this condenser. When this is done, however, it makes the telegraphic relay action sluggish, although it reduces to a greater extent the inductive kick on the line, due to the magnetic energy stored in the telegraphic relay.

The flow of the telephone current and the direct interrupted telegraph current can easily be followed in Figure 26 by means of the arrows. The wavy arrows indicating the telephone current and the straight line arrows the telegraph current.

SIMPLEX CIRCUIT, USING RETARDATION COIL SYSTEM.

There is another method by which one can obtain the results just described in which the repeating coils are replaced by retardation coils.

In Figure 27 is shown a regular simplex circuit utilizing the retarding coil method. These coils usually contain two parallel wound windings upon a very heavy core of iron. The core is made of laminations of soft iron wire which are bent back from the ends of the coil so as to meet in the middle on the outside, thereby making a closed magnetic circuit. A closed magnetic circuit is desirable because of the well-known fact that in a circuit containing a coil with a closed magnetic circuit the variation of potential due to the making and breaking of the circuit are less abrupt than if this same coil were of the open magnetic type. In the latter case the potential of the circuit rises to its full value almost instantaneously upon the making of the circuit and drops off at the same rate when the circuit is broken, whereas the closed coil retards this action to a greater extent, thereby reducing the magnitude of fluctuations in the circuit and since this action is very desirable, in the case under consideration, the coil having a closed magnetic circuit is employed. By referring to the circuit it will be observed that the telegraph circuit is tapped from the middle of the winding of the retardation coil in exactly the same manner that this circuit was attached to the winding of the repeating coil in the previous case, and that the coil is then bridged directly across the line. The telephone circuit is protected from the telegraph pulsations by the condensers placed in each side of the line before the same reaches the jack and consequently since a fair rate of speed

for hand telegraph work is twenty-five words per minute, which would mean about five dots and spaces per second, the resistance of the condensers to so low a frequency would be so large as to force all the telegraph current through the retardation coil. However, since the average frequency of telephone currents amounts to about three hundred alternations per second, we can readily see that the condensers would be of inappreciable resistance to this frequency and that of the retardation coil would be enormous and thus the telephone currents would be forced through the telephone circuit. The paths of the telephone and telegraph currents in this circuit can easily be followed by the arrows, the notation of which in this case and those to follow will be the same as that used in the previous case, i. e., the straight line arrows for telegraph currents and the wavy ones for telephone currents.

There are advantages to be claimed for either of the above described systems and the most important of these may be enumerated as follows: In the first place the retardation coil system is cheaper to install and the efficiency of the talking circuit is not reduced to the extent that it is in the repeating coil system, due to the magnetic transformation in the coil. This is due to the fact that these repeating coils must be designed for transmitting voice as well as ringing currents and consequently are not built to give a talking efficiency of the highest obtainable value. Therefore, when several of these repeating coils are placed in circuit the voice transmission is very materially reduced. However, with the repeating coil system no trouble is experienced in ringing with grounded generators, whereas if this sort of a generator is used with the retardation coil system it will readily be seen that the ringing current will disturb all of the telegraph apparatus in the line. It might be said as a sort of conclusion of the above that the re-

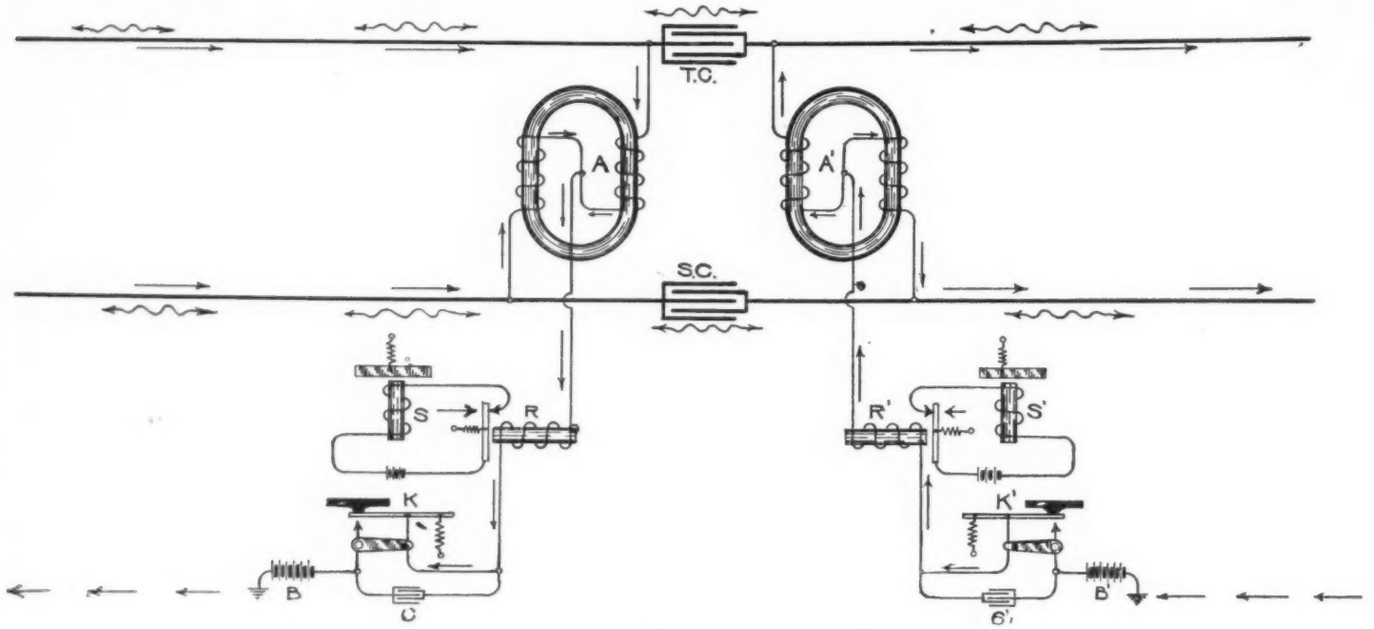


Figure 29—Two different telegraph services connected to a through toll circuit.

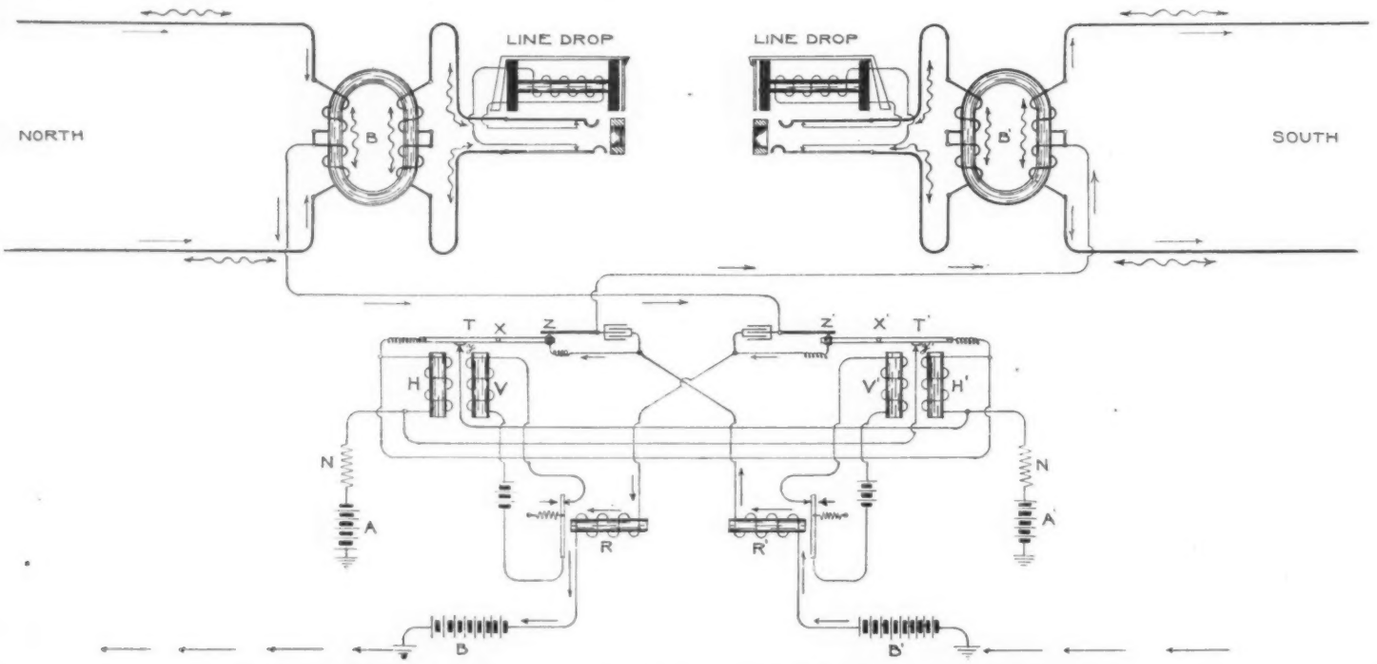


Figure 30—Telegraph repeater connections between two toll circuits entering an exchange.

peating coil system is adaptable to short lines only, while the retardation coil system may be used for any length of line and is vastly superior for long lines.

Having discussed the general theory of the simplex circuit we are now in a position to adapt it to particular cases. For instance it might not always be advisable to locate a telephone terminal station where it is advisable to put a telegraph terminal and vice versa. Consequently methods have been devised for tapping a telegraph or telephone terminal at any station along the line.

In Figure 28 we have shown an intermediate telegraph station in conjunction with a through telephone circuit. It will be noted that with this scheme several telegraph stations can be worked in series on the same line. The general principles explained in connection with the circuit shown in Figure 27 as regards the utilization of capacity and inductance are adaptable to this circuit, wherefore a restatement of the same is considered unnecessary. The paths of the currents can easily be traced by means of the arrows. In Figure 29 we have shown a through telephone circuit and two terminal telegraph stations, that is to say, each telegraph station shown in this circuit operates on a line entirely independent from the other, whereas the telephone circuit is carried straight through. The principal difference between this and the circuit immediately preceding is that in Figure 28 the operation of the telegraph key transmits the message both ways thereby actuating all the telegraph instruments on the line, while in Figure 29 the operation of the telegraph key sends out the impulse in but one direction. This can be readily seen by tracing out the arrow notation.

The intermediate and terminal telegraph stations having been disposed of, it is now only necessary to show a telephone terminal station and the discussion of the simplex system will be completed. In conjunction with the telephone terminal station shown in Figure 30 we have shown a standard American Bell Telephone Company's repeater circuit. This circuit is used in long telegraph lines to boost up the telegraph current, or rather substitute the distant battery by a new one at the local station thus working the long telegraph circuit in parts, each part being controlled by a distinctly separate battery. We think it advisable to give a very brief description of the operation of this repeater in connection with this work.

It will be noted that the telephone taps in Figure 30 are taken off in the usual manner and that the telegraph circuit is looped through from the middle of repeating coil B, through the telegraph apparatus and hence to the middle of repeating coil B^1. The flow of the telegraphic and telephonic currents may be traced by means of the arrows. The description of the operation of the repeater is as follows: All the circuits in the repeater are normally closed as shown in the circuit but when for instance the operator at the distant southern station opens his key it will cause the de-energization of relay R^1, which in turn will de-energize coil V' of the telegraph transmitter. It will be noted that the two coils H and H^1 of the transmitter are normally shunted out by means of a circuit completed by virtue of contacts Y and Y^1 of the transmitter armature. Therefore, when coil V^1 of the transmitter is de-energized it will cause the transmitter armature to fall back. This armature is pivoted at X' and is so arranged that in falling back the contact at Y^1 is broken before the one at Z^1. The breaking of the contact at Y^1 removes the shunt around coil H and thus causes a flow of battery through this coil by means of a circuit that can be traced from battery A^1, through coil N^1, and hence by way of contact Y, coil H and resistance N to battery A and ground. Consequently the opening of the circuit containing relay R at contact Z^1 will not release the armature of the transmitter T. Thus each make and break of the key at the southern station will cause a corresponding make and break at Z^1, and thereby send out an impulse of the new and fresh battery at B on the north end of the line.

In case the operator at the northern station desires to signal the southern operator when the same is telegraphing, the former need only open his telegraph key and he can raise the same due to the establishment of the following conditions. As soon as the armature of transmitter T^1 closes at Z^1 the shunt around coil H will be re-established, and due to the fact that the circuit through relay R is open at the distant northern station the armature of transmitter T will drop back and open the contact at Y. Thus coil H^1 is energized and will hold up the armature of transmitter T^1 and the operator at the northern end is therefore in a position to communicate with the southern operator in a manner identical to that just described for sending messages in the opposite direction.

LARGE TELEPHONE INSTALLATION.

HAVING a capacity of 3,000 pairs the telephone installation in the new Terminal building, Cortlandt and Fulton streets, New York City, is said to be the largest of its kind ever put into any office building in the world. It exceeds by nearly 200 per cent the next largest office installation, that in the Broad Exchange building, New York, which has 800 direct lines, and by 100 per cent that of the Waldorf-Astoria, which has a private branch exchange operating 1,500 extension stations. The first section of this huge installation, consisting of 3,000 lines within the building and 1,200 lines to the central office, has been completed and will be ready for use when the tenants move into the building, May 15.

From the main exchange of the company, on Dey street, the cables run into a vault in Cortlandt street, and thence through a subway into a terminal room situated at the southeast corner of the concourse floor in the building. In the terminal room is the central frame, the center of the whole system and where the 3,000 pairs of conductors in the house cables converge. The two buildings are 22 stories high and together have floor space of about 1,000,000 square feet. In the Fulton building the arrangement allows one pair of conductors for every 310 square feet and one pair of conductors for every 300 square feet in the Cortlandt street building.

A certain number of the circuits, about 1,200 in all, will go directly to various offices from the central office of the telephone company. There are three main cables in the Cortlandt street building with 600 pairs of conductors each and two in the Fulton street building with 600 pairs of conductors each. A tenant who occupies more than one floor, as in the case of the American Bridge Company, will have a special private line cable from their switchboard direct to the floors which they occupy. The main cable from the central office to the floors is continuous and has no wires exposed. All wires, in fact, are concealed in shafts, conduits and in moldings from the point where they enter the building to each instrument. In the installation about 5,000,000 feet of No. 22 wire is used, which, if connected in one line, would reach from New York to St. Louis, about 1,000 miles.

About 10,000 pounds of copper is required for the wiring, not including the bridle wiring from the terminus to each instrument; the entire weight of the wire used, including the coverings, is estimated at 100,000 pounds. When the entire system is completed it will be possible for every one of the 3,000 instruments to be used at the same time.

The Kansas Mutual Telephone Association has been organized with J. B. Shields, of Lost Springs, as president; E. D. Rames, of Delphos, secretary-treasurer, and James Westbrook of Lincolnville, secretary.

TELEPHONE LEGAL DECISIONS

A Compilation of Recent Decisions in Telephone Cases Rendered by the Upper Courts.

By R. R. Rossing.

[Hereafter TELEPHONY intends to report in this department the recent important supreme court decisions affecting telephone companies and telephone affairs. This service will be complete and up to date, including all of the courts of last resort in the United States. Managers and attorneys of telephone companies will find this department a great time-saver, as by glancing over the decisions contained therein they can obtain in ten minutes information of late cases that otherwise would require research and study of law reports covering several days. Following the headline, briefly describing the case, is given the syllabus delivered by the court condensed into few words yet covering the point of law interpreted. The names of the litigants, the name of the court and the volume and page number of the law reports are appended. For the convenience of its readers TELEPHONY has arranged to supply complete decisions of all cases mentioned in the legal digest for a nominal charge.]

COMPANY'S LIABILITY FOR ACT OF CHIEF OPERATOR.

THE act of a chief operator, who was the vice principal of a telephone company for the purpose of maintaining discipline among the operators at the switchboard, in taking hold of the chair of an operator, who had turned away from the switchboard, and violently whirling it around, thereby injuring the operator, was an act of superintendence within the scope of the chief operator's employment, and the telephone company was liable for the injury so sustained.—*Compher v. Missouri & Kansas Telephone Company, Kansas City Court of Appeals, Missouri, 106 Southwestern, 536.*

FRANCHISE WILL TERMINATE WITH LIFE OF CORPORATION.

An ordinance granting a telephone company the right to use city streets on certain conditions is not violative of constitution, article 2, section 14, as making an irrevocable grant of special privileges and immunity in not stating any time for the privilege to terminate, since it will terminate with the life of the corporation.—*People ex rel. Shallberg, City Attorney, v. Central Union Telephone Company, Supreme Court of Illinois, 83 Northeastern, 829.*

TELEPHONE COMPANY NOT LIABLE FOR INTERRUPTIONS NOT PREVENTABLE.

A telephone subscriber is presumed to know that his telephone is apt to get out of order, and that a line running through the country may sometimes get down, and, though a telephone company must use ordinary care in constructing and maintaining its line, it is not liable for interruptions not preventable by ordinary care.—*Eastern Kentucky Telephone & Telegraph Company v. Hardwick, Court of Appeals of Kentucky, 106 Southwestern, 307.*

TELEPHONE FRANCHISE.

Where, under a franchise to erect, maintain, and operate a telephone system, a telephone system already in operation is purchased, the purpose of the franchise is accomplished, and it is without life, in so far as the right to erect and operate another and a new system is concerned.—*Eby v. City of Lathrop, Kansas City Court of Appeals, Missouri, 107 Southwestern, 410.*

STATE REGULATION OF TELEPHONE CHARGES.

The constitution of this state in terms grants to the railroad commission the power to make regulations to govern the "tariffs and service" of carriers of passengers and freight, and in equally explicit terms grants it the power to make regulations to govern the "charges" and "rates" of telephone and telegraph lines; and this court finds no warrant for holding that the discrimination was not intended.—*Western Union Telegraph Company v. Railroad Commission of Louisiana, Supreme Court of Louisiana, 45 Southern, 598.*

INCORPORATION STATUTE NOT APPLICABLE TO LOCAL TELEPHONE EXCHANGE.

Kentucky statute, 1903, section 576, requiring each corporation, except those of certain classes, to have its name placed on its "principal" place or places of business, with the word "incorporated" thereunder, does not apply to a local exchange office of a telephone company at which an assistant manager is kept, where the general business of the company is transacted at offices at other places, to which the local offices report.—*Commonwealth v. Cumberland Telephone & Telegraph Company, Court of Appeals of Kentucky, 108 Southwestern, 262.*

CITY CANNOT IMPOSE ADDED CONDITIONS TO FORFEIT TELEPHONE COMPANY'S RIGHTS.

A replication to a plea to an information in the nature of a quo warranto to oust a telephone company from the use of city streets, which relies upon implied conditions not contained in the ordinance which the defendant relies on in his plea to show its license to use the street, is bad, since the city could not impose new or added conditions not contained in the ordinance to forfeit the company's rights.—*People ex rel. Shallberg, City Attorney, v. Central Union Telephone Company, Supreme Court of Illinois, 83 Northeastern, 829.*

TELEPHONE FRANCHISES.

Constitution, sections 163 and 164, providing that no telephone company within a city shall be authorized to erect its poles, etc., over the streets, etc., without the consent of the legislative body of the city, and that no city shall grant any franchise in reference thereto for a term exceeding twenty years, etc., are mandatory, and must be read together in determining when a franchise to a company may be granted, and a franchise to establish and operate a telephone system in a city can only be acquired by complying therewith.—*Rural Home Telephone Company v. Kentucky & Indiana Telephone Company, Court of Appeals of Kentucky, 107 Southwestern, 787.*

TELEPHONE COMPANY'S DUTY TO GIVE SERVICE.

Plaintiffs advanced the cost of extending a telephone line, guaranteeing the company a certain number of subscribers. The company agreed to deliver service receipts to plaintiffs, the face value thereof to be credited on the company's debt for the money advanced. Held, that the company was bound to plaintiffs to use ordinary care to maintain its line in order, and, if it failed to do so, it is liable to plaintiffs for damages in the amount that the rents were reduced through the company's negligence, to be credited on the company's debt to them.—*Eastern Kentucky Telephone & Telegraph*

Company v. Hardwick, Court of Appeals of Kentucky, 106 Southwestern, 307.

TELEPHONE COMPANY'S RIGHTS PARAMOUNT TO HOUSE MOVER'S.

Where a telephone company, under powers vested in it by the act under which it was organized, and pursuant to the direction of the authorities of a village, erected poles and wires in the village streets in such a manner as not to interfere with all ordinary public uses, the company acquired vested rights therein paramount to the rights of a person to interfere with the company's wires for the purpose of moving a building through the streets, so that the interference with the wires for such purpose would be an appropriation of property without due process of law, which would be restrained.—*Kibbie Telephone Company v. Landphere, Supreme Court of Michigan, 115 Northwestern, 244.*

DANGEROUS PLACING OF GUY WIRE.

An electric company maintained one of its poles on a street about six inches from the outer edge of the sidewalk. A telephone company had placed a guy wire on the top of the pole, which extended across the live wires strung thereon, and hung to within a few feet of the ground. The wire became charged with the current, and caused the death of a person placing his hand on it. Held, that the telephone company, in attaching the guy wire, and in allowing it to remain in a dangerous position, and the electric company, in not removing the wire, were each guilty of negligence, which was an efficient cause of the entire injury, and were each liable to the full extent of the injury.—*San Marcos Telephone Company and San Marcos Electric Light & Power Company v. Compton, Court of Civil Appeals of Texas, 107 Southwestern, 1151.*

AGREEMENTS BETWEEN TELEPHONE COMPANIES.

A telephone company, operating a system with exchanges in a city and elsewhere, was desirous of extending its country business, and was instrumental in organizing another company, with a system and exchanges at various points. The companies were separate corporations, but the general manager of the former was the president of the latter. The two companies operated their systems as one under an arrangment, continuing for several years, by which there was a physical connection between their wires. There was no written agreement or definite verbal contract between them. Held, that the arrangement did not amount to a contract and did not entitle either company to the reciprocal rights and obligations growing out of contract rights, and one company could not by reason of the arrangement compel the other company to continue to receive and transmit the messages of the former.—*Rural Home Telephone Company v. Kentucky & Indiana Telephone Company, Court of Appeals of Kentucky, 107 Southwestern, 787.*

TELEPHONE ASSOCIATION NOT DE FACTO A CORPORATION.

Members of three informal mutual telephone associations tentatively adopted articles of incorporation and elected officers and directors, but a few days later laid the articles on the table. The proposed directors contracted with an existing telephone company for joint operation of the lines. Subsequently, dissension among the members having arisen, defendant and another proposed director failed to act further, and the board attempted to fill their places. The reorganized board levied an assessment for incorporation and operating expenses, which defendant and ten others of the thirteen members on one line refused to pay. Afterwards, articles of incorporation were filed by one member from each of two of the lines and two from the third. The articles did not purport to include nor recognize by name as members all persons who previously attempted to act as directors, and did not ratify their action. Held, that the assessment may not be sustained as against defendant, on the theory that there was a de facto corporation.—*Middle Branch Mutual Telephone Company v. Jones, Supreme Court of Iowa, 115 Northwestern, 3.*

TAXATION OF TELEPHONE CONDUITS.

The city of Portland sought to recover a tax assessed by the city upon the conduits of the defendant company as real estate, in addition to an excise tax assessed upon the defendant by the state. The conduits in question were laid in the streets of Portland under the authority of section 1, c. 204, p. 313, Priv. & Sp. Laws 1891, by virtue of license therefor, granted by the municipal officers according to regulations established by them. Under these regulations, the location of the conduits, wherever made, was subject to revocation and change at the order of the municipal officers. The quality of permanency in the annexation did not exist, and the conduits were not laid for the benefit of the freehold. It is also provided by Rev. St. c. 8, § 41, that the excise tax assessed upon the company "shall be in lieu of all taxes upon * * * its property used in the conduct of its telephone or telegraph business, including the poles, wires, insulators," etc. But the statute contains no specification of the conduits of the company among the items of personal property thus exempted. The method of conveying telephone wires by subterranean conduits, instead of poles, had not been adopted, however, at the time of the passage of the original act of 1883 providing for the taxation of telephone companies held,

That it was the purpose of the Legislature to impose upon the telephone companies an excise tax for the privilege of doing business in this state, and to exempt all personal property used in its business, leaving only its real estate, such as land and buildings for local taxation, and that the question whether the expression of one thing in the statute is to operate as the exclusion of the other is one of intention to be gathered from an examination of all parts of the statute by the aid of the usual rules of interpretation.

That, under the circumstances of this case, the conduits of the defendant company in the streets of Portland, being in fact a part of the property used by the company in the conduct of its business, are properly held to be embraced in the term "property" referred to in Rev. St. c. 8, § 41, that they are not excluded by the express mention of other items of exempted property in the same section, and that they are not subject to taxation by the city of Portland as real estate.—*City of Portland v. New England Telephone & Telegraph Co., Supreme Judicial Court of Maine, 68 Atlantic, 1040.*

PURCHASE OF SYSTEM PREVENTS FRANCHISE GRANTEE FROM ERECTING A NEW SYSTEM.

Where, under a franchise to that effect, a telephone system is erected, maintained, and operated, the function of the grant is fulfilled, and the franchise is without life, in so far as the right to erect and operate another and new system is concerned.—*Eby v. City of Lathrop, Kansas City Court of Appeals, Missouri, 107 Southwestern, 410.*

NEGLIGENT PLACING OF GUY WIRE NEAR GROUND.

It is negligence to maintain a guy wire from a telephone post to the ground some 25 feet therefrom, and within the line of travel between a street and railroad station grounds, without anything to attract attention of one approaching the station in the dark.—*Grant v. Sunset Telephone & Telegraph Company, Court of Appeals, California, 94 Pacific, 368.*

SIMULTANEOUS TELEPHONY AND TELEGRAPHY

The First of a Series of Articles on a Most Important Branch of the Science

By Francis R. Hoyt

ONE of the most important developments in the past year or two in telephone work is the constantly increasing number of duplexed toll lines. While this system is not by any means a theoretically new branch of the telephone art, it is in reality only in its infancy as a commercial branch, yet it has been applied for a sufficient length of time to prove its efficiency beyond any doubt.

The combination of telephone and telegraph service upon the same line wires affords double the capacity of any toll office, and allows both telephone and telegraph communications to be rendered under the supervision of one management, and with practically no additional cost for installation and maintenance.

The increased revenue derived from a duplex toll line is

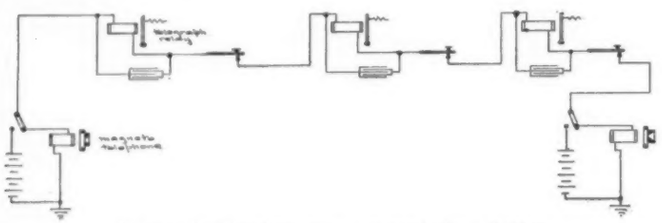


Figure 1—Simultaneous transmission theory.

astonishing, which makes it very difficult to understand why the system has not been applied long ago by every telephone company operating toll lines. There are a number of ways through which large revenues can be derived from the telegraph side of the duplex circuit. The principal one consists in leasing the circuits to large establishments who have branch houses in other cities, with whom they must be in constant communication. Under such circumstances, the telegraph side of the duplex system offers great advantages on account of its privacy, commercial utility, and extreme cheapness. Again, the leasing of these circuits to brokerage concerns, who operate establishments in the cities reached by these toll lines, is one of the most common forms of handling leased circuits. Another method is to supply the so-called railway composite instruments to railroad com-

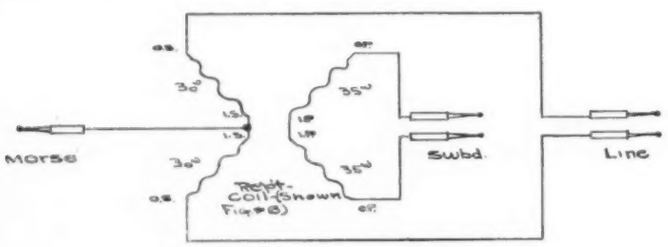


Figure 2—Repeating coil simplex plan.

panies for their private use on the telegraph lines operated by them. In many ways this is one of the most wonderful circuits ever put into actual use, as it can be added to any quadruplex circuit and permits of four separate and distinct telegraph messages and one telephone communication to be in progress at one time over one grounded telegraph line, and that without introducing objectionable interference between the different circuits. This system is very efficient when used on grounded telegraph lines, and has been applied in some cases to lines over 150 miles long.

Another condition under which the telegraph has proven itself an adjunct to the telephone company, when operated by the latter, is in the case of a heavily loaded toll line, that is, a toll line which at certain periods of the day or night is so congested with calls that every minute lost by operators in making appointments, getting parties, up, etc., means dollars to the telephone company. If the telegraph is brought into play, appointments can be made, parties held, and in fact all the preliminaries of a future call as well as all checking of past calls can be done while the line is being used for actual conversation.

In addition to these points of advantage to the telephone company there are numerous reasons why firms doing a private telegraph business, and especially brokerage concerns who furnish stock market quotations, desire the class of service offered by telephone companies. First of all, because the telephone side of the duplex means dollars to the telephone company, and in the case of a break down they exert every factor possible to restore service immediately, so that when faults of this kind occur the time which elapses in the interval is infinitesimal as compared with the time required by a telegraph company in restoring service

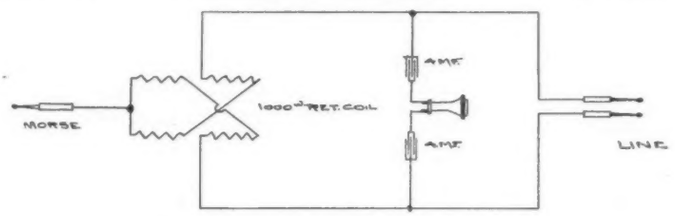


Figure 3—Retardation coil simplex plain.

under similar circumstances. And another great advantage is that there are no false signals to contend with as there are on leased lines from telegraph companies. All telegraph companies' circuits are heavily loaded, and at the very best a brokerage concern can only secure one side of a quadruplex from them; in which case any circuit unbalancement means that they will receive false signals, conditions sometimes becoming so bad that for hours at a time they will receive messages intended for other concerns, absolutely destroying business privacy.

The fundamental principles of simultaneous telephony and telegraphy are in a few words as follows: (a) You can telegraph through an impedance but not through a condenser, and (b) you can telephone through a condenser but not through an impedance. As stated before, simultaneous telephony and telegraphy is not a new branch of the telephone business. In fact, there appears in the records at Washington a patent dated as early as May 7, 1878, covering what is today the first step in one of the most elaborate systems in use. This circuit, shown at Figure 1, is nothing more than a grounded telegraph line with condensers bridged around the telegraph relays or actuating

apparatus to permit of the free passage of the voice currents. Though this circuit in its day was a wonderful advancement in telephony it had its drawbacks when put into practice, and in reality it is not a simultaneous circuit, as it was only intended to use the telephone at such times as the telegraph was idle. This, however, could be remedied by a proper arrangement of connections, but in that case we would encounter several drawbacks; chief among these being that for ringing purposes a high frequency current would necessarily have to be used, because to ring with a

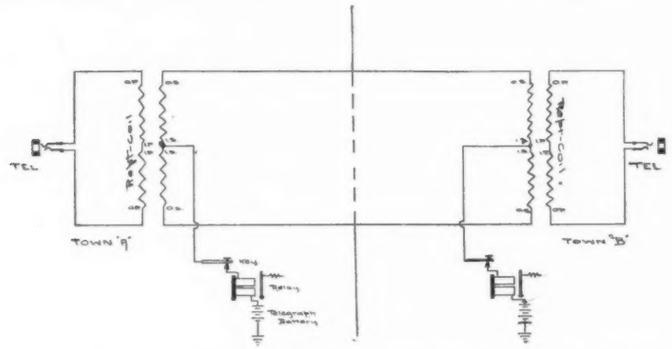


Figure 4—Two terminating stations of repeating coil simplex system.

magneto or generator one side would have to be grounded and the current from the other side would chatter all of the relays whenever applied to the line, thus interfering with any signals which might be in transit at that time. In the form shown the system was never adopted as a commercial branch or addition to the telephone or telegraph office, but it thoroughly demonstrated the fundamental principles as outlined above, which proved the stepping stone for other great minds; and as a natural sequence there followed our present day simultaneous telephony and telegraphy systems. The railway composite used to such an extent all over the country today is merely an elaborate form of this simple circuit.

We may say that simultaneous work is divided into four classes, which are as follows:

First, simplex circuits, that is, a circuit by which one telephonic and one telegraphic communication can be transmitted over one metallic telephone line.

Second, composite circuits, or circuits by which two telegraphic and one telephonic communication are made possible without the least interference over one metallic circuit.

Third, polar duplex circuits, which render four telegraphic and one telephonic communications not only pos-

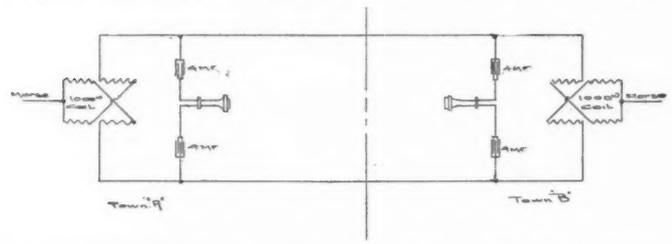


Figure 5—Two terminating stations retardation coil smplex system.

sible, but of the highest commercial efficiency, and when properly installed and balanced, give equally as good results as either the simplex or composite.

Fourth, railway composites, so termed because they are merely telephone circuits added to the telegraph lines usually operated by railway companies, so that they can despatch their trains, or in fact conduct any business quickly and privately over lines already doing manifold duty and without paying a toll or having any additional maintenance cost. No matter how heavily loaded the line may be nor how old the iron wire, it is possible to secure a good conversation over distances of from 125 to 150 miles, and never know you are talking over a line carrying telegraph messages, provided the line is well insulated with respect to the ground.

Simplex circuits in turn are divided into two main branches, i. e., those using repeating coils at either end of the line with the telegraph tap taken off of the line side of the coil as shown at Figure 2, and those using a retardation coil with the telegraph tap taken off of the center of the coil as shown in Figure 3. Both of these circuits are used extensively by long distance companies throughout the United States, some using one and some the other. In most cases it depends entirely upon the amount of telegraphic work they intend doing or will be able to do, which circuit they adopt. Primarily each has its advantages over the other, but from a commercial point of view, that is, as regards transmission, the retardation coil simplex has a shade the better of the two circuits, and can be rung over a considerably greater distance. However, the circuit shown at Figure 2 is the one most used where the business is not great enough to justify the installation of composite ringing equipment, the stronghold of this circuit resting in the fact that any exchange generator or pole changer whether

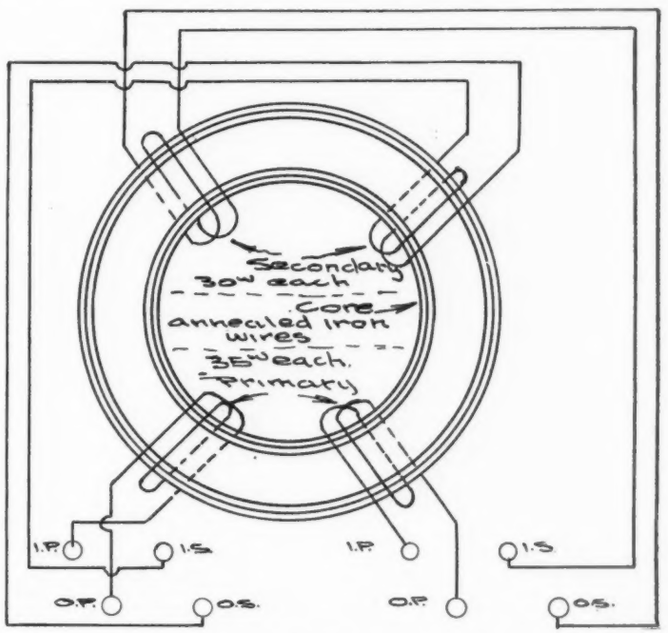


Figure 6—Repeating coil for simplex work.

grounded or not will do for ringing purposes, but is limited to one hundred miles of aerial line (No. 12 copper), including five miles (No. 19 gauge) underground cable; which figure is based on a generator typical of the average used in telephone exchanges throughout the country, that is a two-pole machine usually run at about 1,000 revolutions per minute with a secondary output of from 75 to 90 volts alternating, or about the same as a Warner pole changer.

A glance at Figure 4 will show the electrical operation of the repeating coil simplex, which is simple in the extreme. The conversation is carried on through the repeating coil and over the line wires; the telegraph tap being taken off of the line side of the repeating coil forms virtually a wheatstone bridge arrangement, the current flow dividing in the center of the coil and flowing equally through the imaginary arms of the bridge, producing no circuit unbalancing and consequently no inductive disturbances. The actual current flow is prevented from flowing back to the switchboard side by the open circuit relation of the two windings; ringing over this line is done the same as in any other case where repeating coils are used, and does not chatter the telegraph relays as only the alternating impulses

are transmitted over a repeating coil and not the ground effect, which would be necessary to chatter a relay so connected.

It would be well to mention here that this is the only simultaneous circuit that is not based on the fundamental principle as given before, but instead is based on the wheatstone bridge theory of balanced circuits, which is made possible by the use of the repeating coil.

The repeating coil used in this circuit is one that to give the proper results requires some deliberation in building, as it must serve the double purpose of ringing as well as talking, and more than that must offer as little impedance as possible to the high frequency voice currents traveling either into or out of the coil; yet on the other hand, the primary and secondary windings with respect to one another must present as great an inductive choking effect as possible in order to choke the make and break discharges of the telegraph key which otherwise would produce a series of low interruptions on the switchboard side of the coil exactly the same as the telegraph impulses being sent at that time on the line side of the coil. At a single glance it seems hard to believe that a coil which will work properly when connected as shown at Figure 4 will not work if the terminals marked *O. P.* and those marked *I. P.* were to be reversed, in other words will induce from its outer terminals in, but will not induce from its inner terminals out; yet this is a fact and is the whole solution of a repeating coil to be of practical use on simultaneous circuits.

Figure 6 shows an excellent coil for simultaneous purposes, and throughout this talk it will be taken as a standard. Repeating coils are made in two main forms generally, one form having a closed magnetic circuit and the other having an open magnetic circuit; here, however, it will be unnecessary to consider the last named form. The output of a repeating coil depends on the number of turns in the primary and secondary, the number of lines of force cut, and the rate of change. Knowing this and also the great difference in the frequency of ringing and talking currents, it follows that a coil suitable for our purposes must adapt itself to both conditions readily.

The core of this coil is made of fine wire carefully annealed to prevent hysteresis losses and each individual wire is thoroughly oxidized in order to form a resistance or partial insulation between themselves.

As the frequency of talking current is very great, it follows that if the iron core is at all sluggish the speech will be distorted and transmission will necessarily be very poor, which means that as small an amount of iron should be used as possible, because the more iron the more sluggish the coil becomes. Yet on the other hand, the frequency of ringing current is very low, consequently there should be a great number of turns, and a great number of lines of force cut, which would also mean a large amount of iron in the core. From this it is easy to see that a happy medium will have to be struck, that is, a coil which will not prove detrimental to talking currents, yet will allow enough ringing current to pass through it. In addition, this coil must be so wound on the primary and secondary that the line when connected to the proper terminals will feel no great impedance as the result, that is, each half of the primary and secondary must be in agreeing series with the other half of its repective winding. A peculiarity of this coil is that the four windings are on opposite sides of the core from each other, not like most coils in which one-half of the secondary is wound over its respective half of the primary. A glance at Figure 6 will show that an alternating current passed through any one of the four windings will cause magnetic lines of force to be generated in the iron core, which will cause similar fluctuations in the other three windings. Another peculiarity and the most essential thing to a simultaneous coil, is that while each half of the primary and secondary when properly connected to a line are in series so far as the direction of the windings go, yet on a close examination it will be seen that a current applied to the center of the coil as the telegraph current is, and forced to flow out through the two windings in equal parts, does not find its path through the coils in series, but instead, as this current flows from the terminals marked *I. S.* and *I. S.* through each of the two windings to the line, its path through each coil is in exactly the opposite direction from the current in the other half; consequently it is plain that the reason there is no induction from the telegraph tap, is because when this current flows it makes its way out in a differential path and does not cause any magnetic lines of force to be generated in the iron core, so there can be no change of value in the other windings.

In this way the voice currents coming into the coil induce from the secondary to the primary windings exactly the same impulses, but the telegraph current flowing from the center of the coil does not cause any variation on the windings opposite.

Repeating coils for simultaneous purposes will naturally assume a larger size than the average coil, and should always be provided with a boiler plate or cross-talk proof cover where more than one coil is used, to prevent mutual induction between coils.

TELEPHONE OPERATOR WINS SUIT.

A STORY that comes from Sacramento, California, is of more than usual interest to telephone managers and employes. W. A. Woods, a citizen of that place, endeavored the other day to secure a telephone connection in a hurry on an important business matter. Instead of giving him the number for which he called, the telephone operator connected him with a woman who insisted on explaining to him that she wanted him to send her at once a pint of milk and a dozen eggs. Woods' ire was roused to the boiling point. Just as soon as he could get away from the woman he called the operator up and swore at her. The girl very promptly had Woods arrested. In the justice court he entered a plea of guilty, but set up by way of extenuation the fact that he had been sorely tried. The justice refused to consider any circumstances as mitigating the offense of swearing at a woman. He imposed a fine of $20 on Woods, with the alternative of twenty days in jail.

Commenting upon the court's action an exchange says: "We wish that every man who swears at a telephone girl could be run down and punished. The practice is altogether too common; the young women who handle the calls in a telephone exchange are entirely too forbearing. Men who would not dream of being even rude to a woman when talking to her face to face are too brutal for description in their treatment of telephone operators when the latter seem a trifle remiss in their duties. They should be made to suffer for their conduct.

"The lot of the average telephone operator is not, at best, an entirely enviable one. To sit at a switchboard for several hours on end, with lamps glowing or drops falling in every direction, with fingers fairly fiying in the race to keep up with the work, is not the easiest occupation in the world. The wonder is not that the operators make mistakes, but that they make, comparatively speaking, so few. They keep up excellently well, everything considerel. And they are doing their very best to be accommodating all the time.

"They are entitled to and should receive the utmost courtesy from the public. We have never believed that anything was to be gained by being ugly with telephone operators. We have never believed that they deliberately try to inflict poor service upon any one, although they would hardly be human if they failed to make matters just a little harder for people who make senseless and unnecessary complaints to and about them."

TELEPHONE INDUCTION

A Paper Read Before the Pittsburg Branch of the American Institute of Electrical Engineers

By E. B. Tuttle

THE subject of induction is, of course, an important one between the telephone engineer and the power engineer. Especially since the single-phase trolley lines have been put in operation, telephone engineers have had voluminous discussions and have done considerable investigating.

I wish to speak tonight simply in reference to the three-phase line with the grounded neutral, with or without ground resistance. I have taken as a possible case a three-phase transmission line forty feet above the ground, with five foot spacing, and a telephone line, say on the opposite side of the highway, a distance of forty feet, the telephone line placed a distance of thirty feet from the ground and the wires, say one foot apart, and have considered the case of No. 12 N. B. S. telephone circuit.

It has been brought out quite plainly that in the case of the transmission line being without neutral ground, the induction is not at all considerable under normal working conditions, the potential of the three lines being maintained through the capacity to ground. I find that in considering a 60,000-volt transmission line the induction per mile on a telephone circuit, under those conditions, will be about four-tenths of a micro-ampere flowing from one to the other. I might state that the telephone company has looked into the question, determining if possible the amount of current which can be flowing through the subscriber's receeiver without any objection being raised on his part, and this has been determined to be not over fifteen or twenty micro-amperes.

In case the neutral is grounded we immediately have the conditions which were described by Dr. Steinmetz in his discussion at New York on September 28, 1906, in which he stated that there immediately appears, if the neutral is grounded at one end of the transmission line only the triple harmonic in all of the three circuits of the star-connected transformer, and these three being in phase, will in some cases amount to as much as one-half of the total potential between the lines. So that in case of a 60,000 volt line we would have a triple harmonic which would have a potential somewhere in the neighborhood of 30,000 volts and with the neutral grounded this would raise the entire system of the lines up and down from negative to positive through a range of 30,000 volts. This produces in the telephone line nine micro-amperes of current, which is not a very formidable amount. With a 20,000 volt circuit, such as is used to considerable extent in this neighborhood, we would get three micro-amperes of current.

Now in case the neutrals at both ends of the line are grounded this voltage is immediately destroyed unless the grounds are of high resistance. The triple harmonic disappears and there comes in place a current of triple frequency flowing through the three lines in parallel, which is approximately one-third of the magnetizing current of the transformer, and since the magnetizing current is not over five per cent and the triple harmonic current being about one-third of this, we get approximately two per cent. Taking the case of the Ontario traction line where 30,000 horsepower is being transmitted, this would give us somewhere in the neighborhood of two or four amperes flowing in the three circuits in parallel. This gives a value of .45 and .9 micro-volts across the line, respectively.

I did not calculate the induction with no neutrals grounded, but with one neutral grounded a triple harmonic gives us sixty-six micro-amperes for ten feet separation, and with both neutrals grounded, about 2.5 volts. This, of course, is the current of voltage induced per mile in every case, and I have taken the mile as reference length from the fact that for cross-talk purposes telephone lines have to be transposed about once a mile.

In the case of a 20,000 volt line the values would be one-third as great. While telephone lines are never built within ten feet of a 60,000 volt transmission line, it quite frequently occurs that 20,000 volt transmission lines are built within ten feet of telephone lines, and in that case the effect is approximately ten times as great as in the case of forty foot separation.

A much more difficult proposition arises from the question of insulation. A very good, well-insulated telephone has about ten megohms per mile of insulation. We will take a condition of no grounded neutrals and suppose that one side of a circuit becomes grounded. We will then get static potential sufficient on the telephone lines to cause a flow of 876 micro-amperes to ground through ten megohms of resistance at a separation of forty feet. As is quite frequently the case, suppose that one side of the line has an insulation of ten megohms and the other side of the line may have a much higher insulation; in one particular case I remember, thirty-four megohms. In that case we would get thirty-three micro-amperes of current flowing from one side of the line to the other per mile, and it should be remembered that this is not affected by transpositions. This difficulty multiplies by the number of miles. Under the same conditions, if one neutral is grounded we would get 2,206 micro-amperes due to the triple harmonic to ground through the ten megohms and we would get 331 miero-amperes per mile across the pair if the insulation of the two sides of the telephone had ten and thirty-four megohms insulation, respectively.

We will take another condition which frequently occurs. Suppose the insulation of one side of the line drops to one megohm. It is still a good commercial circuit and can be used without any difficulty under favorable circumstances. In this case we would get across the pair at one end with the third harmonic with one grounded neutral, 686 micro-amperes with forty feet separation.

The other condition which we must consider is the abnormal condition which occurs with two grounded neutrals when one line is out of service. In this case a current flows through the neutral to ground about 1.73 times as great as the current in the line. Suppose that were 100 amperes, in that case there would be 1.8 volts per miles electro-magnetic induction between the two sides of the telephone service. This is prohibitive to the use of the line for telephone service. In the case of a line ten feet away the induction would be fourteen volts.

These are points which show some of the results with a grounded neutral, and in the above abnormal condition, there would be practically a single-phase transmission system with ground return and even worse, because there are no rails to carry the return current. In the case of the single-phase line the rail return is sufficiently close to assist in overcoming the induction due to the trolley current.

The Inspector and The Troubleman

By A. E. Dobbs

SECOND INSTALLMENT.

TOLL LINES.

WOULD it not be better if that bracket line we went over yesterday was cross armed?" asked Will next morning when he had nothing else to say.

"The line doesn't make us any trouble, does it?"

"No, we haven't had a line trouble on it since I've been here."

"Could a cross-armed pole-line do any better?"

"But those brackets are not as strong as an arm, and you can't tell what might happen, and then they don't look so well."

"It seems to me you are borrowing a great deal of trouble; would it not be just as well to wait till the line shows signs of falling down before we begin to rebuild it? Now in this case the line was built to the town of A when there was nothing there but a toll station. Well, they built up an exchange at A, and ran the toll line to the next town of B, which also built up an exchange. At first, it seemed that one line was all that would ever be needed, but when those towns were built up another line became necessary to handle the business, and last summer we built a third one as far as A. Bracket lines can be made to look as well as those carrying cross-arms, and they are almost as strong if put on with six-inch wire nails. They are cheaper than cross-arms, and a great deal less trouble when among trees. Now my plan of building a bracket line is like that shown in Figure 5, in which the brackets are placed opposite each other, which makes the lines come from eleven to thirteen inches apart. The second line is fourteen inches below, and spaced the same way.

"Thus, these wires, even though they do look close together, are as well spaced as those on a cross-arm. We have become so used to seeing brackets spaced from two to three feet apart, and wires hanging with all degrees of slack, that a well-built bracket line looks odd to us.

"In the plan I have shown the wires must be pulled so that there is not more than five inches of sag between poles. A bracket line must be as firmly guyed and braced as a cross-armed line. With such construction a bracket line will be as satisfactory as any other. Now, don't go off and tell people that I said a bracket line is as good as a cross-armed line, for I would prefer to see the latter. I merely wanted to point out the way to make a *good* bracket line. Neither must it be forgotten that with the plan shown in Figure 5 the lower wires will sag to within about eighteen feet of the ground, provided twenty-five-foot poles are used.

"One thing more. If we should determine to put cross-arms on the poles, we will not use anything smaller than a six-pin arm, and let me tell you in strict confidence that a ten-pin costs but a trifle more, and we don't have to change it, should it so happen that we need more than three circuits. For country lines it is best to have the pins placed twelve inches apart, as there will be less trouble with them."

TRANSPOSITIONS.

"I wish," said Will, "you would explain toll-line transpositions. I have noticed that you make those transpositions for different lines on different poles, but is there any good reason for it, and do you have any regular plan for doing it?"

"Do you remember the first toll line you worked on as a ground hand?" asked George, "where there were two transposed circuits? Do you remember seeing any marks on the poles?"

"Yes, some of them were marked with an X."

"Yes," said George, "and if you had observed closely you would have discovered that there was an X on every tenth pole, and that each transposition on the same line came forty poles apart. Where it passes alongside a trolley road and through two towns, I afterward transposed every tenth and in some places every fifth pole, to get rid of the trolley and electric light induction. Here is the plan of that line (Figure 6). Being a bracket line, the wires were disposed somewhat differently from those placed on cross-arms. For convenience, we will mark all those X's as A, B, C, B, A, or T_1, T_2, T_3, T_2, T_1, which is the plan followed by most long-distance companies. As I said before, there is in this case an X-mark on every tenth pole, and as there are forty poles to the mile, that makes a quarter of a mile to each transposition pole. But we do not transpose every quarter of a mile. Now turn to the diagram and follow the top line, remembering that the letters A, B, C, B, A, are a quarter of a mile (ten poles) apart. It is easy to see that the transpositions on that top line, which occur only when the letter A is met with, are a mile apart.

"Then we build a second line, and in order to break up inductive effects we did not transpose at the same place as the other. Oh, no. We come back half way between those two transpositions at A, and transpose our second line at C. Thus our second line is crossed over at exactly the middle of the first line section. Now, when we ran the third line this summer, which is shorter than the other two, we concluded to make twice as many transpositions, or one every half mile, instead of every mile as heretofore. Our reason for this is that a short line is very much overbalanced by the static induction of longer lines, so that more transpositions are necessary. Therefore, we transpose this one every time the letter B is met.

"Now, should we ever run a fourth circuit on brackets, I should probably arrange transpositions three-quarters of a mile apart, as shown, though there are several other arrangements just as good. We might transpose every quarter of a mile, but in an open country that would be unnecessary trouble. We could also transpose every half mile from the middle of the third circuit, taking the poles at A and C; or as there are two circuits interposed between it and the top circuit, we might transpose it on the same pole at A only. One of these methods is as good as another. Our reason for transposing in this manner is that we break up the inductive effects more thoroughly.

"Take lines No. 1 and No. 2, for example; supposing that both are in use at once. The current from No. 1 throws two different currents into line No. 2. One is the electrostatic induction, which travels in a direction contrary to the current that produced it, while the other is the electromagnetic, which travels in the same direction. Now, by making a transposition in the middle of the section of line No. 2 we get the static effect on the two opposite sides of the

circuits, so that these stray currents meet and kill each other. That is the whole secret of transposition, to keep your inductive currents balanced. There is no hard and fast rule for making transpositions, and the man who makes a blue print of a line before it is built may have to modify it considerably before he gets through unless he has made a careful inspection beforehand.

"If your line is noisy when built, try and locate it. You can tell by listening whether it comes from a trolley, telegraph, electric light line or ground. If in doubt as to its location, take a test set, get out on the line, open up both sides and listen first on one end, and then on the other. By following this up you can soon run it down. If you think

Figure 5.

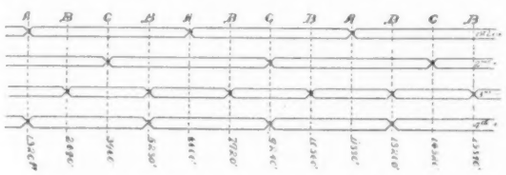


Figure 6—A bracket line.

that more transpositions are necessary in certain places, take a receiver and listen on the line after every transposition is made, to judge of the effect. Keep cutting in transpositions till the line becomes quiet. Then stop and let well enough alone.

"Figure 7 shows you the plan generally followed in long-distance work and mapped out for two cross-arms. Should there be a third arm, it would follow the same plan as the first, the wires of the second acting as a shield between the first and third. This is by no means the only method of transposition but it is one of the simplest and easiest to follow. Besides, when there are several gangs at work on one line, they must have a plan, so that their work will agree. In very long lines it is possible to carry out a blueprint plan of transposition much easier than in shorter ones, because local disturbances have more of a chance to distribute and equalize themselves. On shorter lines, it may even be necessary in some places to transpose every five or six pole lengths.

"Whenever an electrical impulse passes over a circuit there is, for an instant, an impulse thrown off into space also, because the change of conditions in the wire affects the static balance of the surrounding ether. It is by taking advantage of this phenomenon that wireless telegraphy becomes possible."

"Whatever do you mean by static balance?"

"Let me think a moment," mused George. "Can you conceive of being placed in a lonely spot where there is not a sound, not even of the wind, and no signs of life except a railroad track? In that case there would be a static balance in both the track and the atmosphere, because both are at rest. The word itself means stationary, or, rather, one force being balanced against all counter forces. Now, let a sectionman strike a rail with a hammer or a train come rushing along and the balanced or quiet condition of the atmosphere is upset, or disturbed, and we may hear not only the sounds but feel the jar or wind as well as the coarser vibrations of the train, although both sound and wind represent but a mere fraction of the force expended by either hammer or train.

"Let me see if I can think of another analogy. Take a motor boat moving through the water; the water itself may be perfectly quiescent, yet the boat cannot move till it has pushed away the water from in front of it and the water, thus pushed away, must return to the rear to replace the disturbed level; not only this, but, if you will notice, there is also a trail of water dragging after the boat while waves from the bow spread out in all directions. These waves if they encounter another boat will cause it to rock, but if the other boat, going at the same speed and giving waves of the same size, can match its waves with those of the first, they will meet and kill each other so that neither boat will be rocked for the spreading waves will be broken up.

"These are mechanical analogies, but let us suppose that something of this kind takes place in a wire when the current is turned on; let us suppose that electricity is everywhere present but in a state of rest, in the wire as well as elsewhere, and that when current is turned into a circuit it must upset the static balance before it can progress; can you not see that not only the wire but the surrounding space may be agitated?"

"This is all so strange to me that I can hardly understand it at all," said Will, "but how do you know all this; and, where do these waves go to when they leave the wire?"

"If there is no other conductor near them they are lost in space or return to their own conductor again, but if there is, then they follow that other conductor back as far as possible towards the office—because it is an easier path than the air—but, if there happens to be a telephone attached to the conductor, it will appear as noise or cross talk in the receiver; did you never hear the noise from trolley circuits or electric light wires in the telephone? That proves that electric waves pass through space does it not?"

"And how about sending telegraph messages across the Atlantic ocean which is an accomplished fact?"

"If a circuit is perfectly balanced as to conductivity and leakage, one side will be positive and the other negative, and when a positive and negative wave meet they will neutralize each other, but if not they will tend to assimilate to each other or rather, jog along together. Where there is only a single line there is no need of transportation for this effect does not take place as there is no other conductor, but where there are other circuits that might be affected or that might affect the telephone circuit itself, then it is necessary to transpose. The original transposition consisted of twisted pairs the same as you see in all of these duplex house or cable pairs, but in open wire work this is not necessary, so that we give them a complete turnover every second transposition instead of every three inches as in duplex wire."

"The longer the lines the greater the static effect becomes, so the wires must be turned over at frequent in-

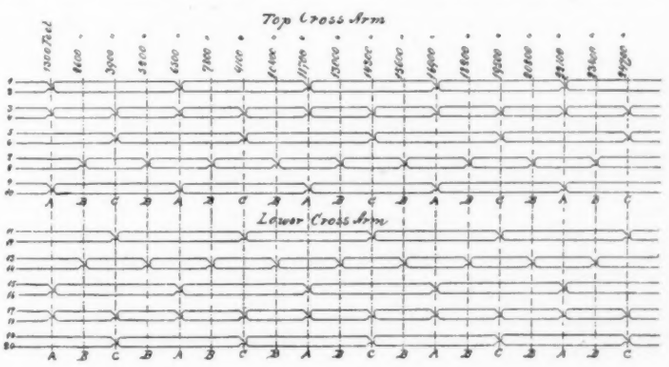


Figure 7—For two cross arms.

tervals of a mile or so at the most. Also, as the middle of a transposition section is the spot where there is a balance struck both ways, it follows that this is the spot where the transposition on the opposite circuit should be cut in."

"One thing," broke in Will. "I should like to know and that is: Why do they number their poles A, B, C, A, or, 1, 2, 3, 2, 1, instead of A, B, C, D, or 1, 2, 3, 4?"

"I really don't know," replied George, "but I suppose the object was to enable the inspectors to start from either end and count straight ahead, for our present scheme counts backward as well as forward, and all transposition plans so far produced, have been made up in the same way."

CONVENTION PAPERS

Some Interesintg Addresses Made at Recent Independent Telephone Meetings

THE DANGERS OF FREE SERVICE.

INCOME should be the slogan with every telephone company, and then—get more income. You cannot get too much, the nature of the business is such that the people are getting more than they contracted for. Every time you add a telephone you increase the value of the service to your subscribers and you can't prevent it. If you stay in the business at all, you have got to take care of it. Your rental rates are fixed, you can't increase them at your pleasure. Under these circumstances where are you going to reap the benefit of the increased number of telephones unless it be from the tolls which are the by-product of your exchange? If you are furnishing free service there will be no income derived from this source, and your increased number of telephones will be continually an increased liability instead of an asset.

Because there are so few sources of revenue in the telephone business it is important that none of them escape. This is especially true of the smaller companies whose main income is the rental of telephones. The public have been led to believe by some people with little or no experience in the business that there is no extra expense in giving free communication to the adjacent towns, since the wires are up and there will be but little trouble in putting up the connections. To those of us who have had some experience in this line, the fallacy of this notion is proven and we must not let the leech, free service, suck our very life-blood.

A careful examination of the operating and earnings statement of any company will demonstrate that their income from tolls is their only salvation, and a further investigation into the nature of their toll business will show that 90 per cent of it is within what is the usual free service zone. Hence, it will be found that the giving of free service is throwing away the most important item of income and withal the most easily earned money.

There is also the item of discrimination to take into consideration. Any company giving free service of any sort knows that some subscribers are reaping a larger benefit than others; and it is unfair to so adjust your rental to all, that you may be compensated in a measure for the service enjoyed by a few. Free service is demanded by the rural subscriber who is so fortunate as to be located within reach of two markets, but who thinks he is abused because he cannot have telephone service with each place without additional expense. Subscribers under these conditions will be found the hardest to handle in trying to eliminate free service, but care and good judgment in correcting this evil will bring them to a realization of the necessity of a toll charge if any service can be had at all.

It is my fortune to be familiar with a situation wherein free service has been displaced by a toll charge resulting in a change in the nature of the business of from upwards of 200 messages a day free, and dissatisfied subscribers, to a number giving a revenue of some $50 to $60 per month and satisfaction. Having been familiar with this situation I have no hesitancy in recommending to all those who are now giving free service an immediate change, as I know of no location where there seemed to be such a deep-set impression among the subscribers that the cutting off of this service was equivalent to making the telephone of little or no use to them. The change, however, resulted in an actual increase in telephones instead of a great loss, as predicted; these predictions being made usually by the class who furnish no revenue to the telephone company.

To change conditions where free service has been the custom is a problem, and my idea of the course to pursue is to be frank and honest, furnishing the subscriber with a plain statement of facts regarding the conditions and what would be the ultimate result if such privileges were continued. It will be found that it is human nature to ride in the conveyance giving the best service, and that most people prefer paying something for the privilege where satisfactory service is given, rather than to ride for nothing and be continually aggravated by some inferior service because of its being free. They must be given to understand plainly that it is impossible to give something for nothing and keep the conveyance in good repair. Under these circumstances I am sure they will treat you fairly and grant the change with but little or no complaint.

The main thing it seems to me is to keep your local service to your subscribers up to the highest standard and at such rates as are profitable, keeping in mind the fixed charge of interest on the investment and the maintenance and operating expense accounts in making the price for rental in all instances. It may be necessary to take the pains to show your subscribers why you must have an income commensurate with the cost of the plant maintenance and operating, but the time will be well spent when you have convinced them that you are not asking them anything unreasonable. And if you are careful and conservative along this line you will never offer the public free and unlimited service to the places where the capacity of the lines cannot be otherwise than limited. Remember, too, that the toll business is the only income you have that is measured, and the only hope of reaping any benefit in the increase in the size of your plant.—*Paper read by Thomas Bromley, Jr., at the Michigan Convention.*

THE MOST IMPORTANT THING TO DO THIS YEAR.

A LOOK ahead at this time reveals a brighter prospect for the culmination of a condition in Independent telephony of this state (Iowa) that we have looked forward to with most sanguine hopes and have labored for for years.

It is admitted without question that whenever the Independent telephone interests of this state will co-operate to such an extent as to all construct uniform toll lines, both in line and equipment, adopt a uniform method for handling long-distance calls, both in operating and accounting, they will be in a position impregnable to competition, their patrons will be guaranteed the best of service, their stockholders assured sounder and better securities and the troubles of the telephone traffic men greatly reduced.

This is a condition that is as sure to be brought about as have the proper conditions in order to harmonize and systematize the handling of diversified interests of other great enterprises.

It is a condition that our interests demand, our patrons are entitled to; it is the only feature our vast interests lack to form them, with their millions of dollars in investments and thousands of stockholders, into one of the largest and strongest business enterprises of the state.

Great strides have been made toward this end, but there still remains a great amount of work to be done before it will be fully realized, and there is nothing more important to do this year than to put our best efforts forward, both individually and collectively, with the determination that before another year we will have accomplished a greater part of this work.

During the past three days we have heard many things of vital interest to our movement discussed, have heard our past achievements referred to in glowing terms and always backed by facts, have had our present condition considered and have heard much of the needs of the future. We have heard of the necessity for closer co-operation in the handling of interchange toll business, necessity for uniform lines and equipment, of the great need for more lines to handle this ever-increasing business.

We have heard our virtues extolled, heard of the phenomenal success of our movement. Our faults, too, have been pointed out in such a manner as to make us wonder that we have succeeded in the least degree and to realize that if we do not correct these faults we shall cease to succeed.

All this has given us new zest, and we feel determined to take a new hold on things when we get back home and make a new record in the service, construction, accounting and in all other branches of our work.

The members of this association unable to attend this meeting for various reasons, will read about the fine meeting we have had, will read in the telephone journals reports of different committees, and will get new ideas from suggestions offered in papers read here.

There is another factor, and a strong one, the consideration of which is highly important, for upon it depends more than any other one thing the ultimate unity of action of all Independent telephone interests. I refer to that great majority of telephone men who are not members of this association, do not attend our state or district meetings nor read the proceedings of any of them. And yet it is highly essential to have their co-operation in our great scheme to bring about thorough harmony of action in handling the business that is coming to us of its own volition, to build and properly maintain the lines necessary to handle it and to establish a uniform method of operation and accounting.

It would be still harder to contemplate an Independent telephone man that does thoroughly understand the situation as it is today that should prefer affiliation with any other than Independent companies.

I do not believe that there is anything that will more quickly convince these men that they should affiliate with the Independents than to acquaint them with the facts as they are today. If every Independent telephone man in Iowa knew of the proceedings of this meeting, knew of the comparative strength of the Independent and Bell companies in Iowa, that the Independents have nearly six subscribers to every one of the Bell, knew of the thousands of miles of toll lines that have been constructed during the past two years, of the thousands more that will be built in

the near future, knew that if the Bell company had its way there would not be an Independent telephone in use in the world; if every Independent or mutual telephone man knew these and many more facts equally as vital, I do not think there is one that would hesitate to cast his lot with us.

If the proprietor or an officer of every Independent company were in attendance at the meeting and were to absorb his share of the spirit of independence, they would go home and do things, act the part of a true Independent, and that sly old octopus would not long have enough business to keep one of his tentacles busy half the time.

It has been shown here that there is a great need for additional long distance lines, and many are of the opinion that the most important thing to do this year is to build them. But who will build them, and how? There are two ways in practice in building long-distance toll lines; either by a company formed especially for the purpose of building the lines and connecting with the local exchanges, or the local company building the line through its respective territory and connecting with another company at the border of its territory. In either event there are many things to consider, but we shall consider but two here.

In the case of the long-distance company, the first thing is for it to know that there is a demand for a connection with its lines from the local company.

In case of the local company building the line, it must first realize the need of the line and then finance and build it. And this brings us back to the question of how best to make these companies see this need and induce them to take the necessary action and at the same time how to induce them to follow our standard of specifications, which will give them better lines, assuring better service and cost less to maintain.

We were much pleased to hear the report of the state agent and of the success he has met with during the past year, and it leads to the belief that we are on the right track. But how much easier his work would have been and how much greater his accomplishments if every man he interviewed had been familiar with the facts regarding the Independent telephone situation when Mr. Hollis first called on him, and how much greater the demand for the services of a state agent would be if the amount of lines that are needed were in projection.

Now is an exceptionally good time for especially the local companies to push construction work, many opinions to the contrary notwithstanding. There is not a district in the United States that has been affected so little by the financial stringency as the state of Iowa, and while material is much lower in price than it has been for years, these companies should be awakened to the need of this development now. And every toll line built by a local company is that much of a barrier against that company connecting with any other than Independent toll lines.

It therefore appears that the most important thing to do this year in order to hasten the culmination of this condition to which we have looked forward so long, is to get every man in the Independent and mutual telephone business in the state of Iowa, whether proprietor, officer or stockholder, interested in our common cause. Get them to know that their interests are identical with ours, that we can all help each other, that, in fact, we can be of more benefit to them than can any other company; that they build and own their toll lines, and the many other advantages. And, first, last and all the time, that they will be Independent.

Individually we should and will continue to work as we have in the past; we will continue talking Independent to everyone on all occasions, writing Independent to them, getting them interested in our association, in our work. Whether or not this association will devise ways and means for carrying on a campaign of education, as it might be termed, either through the medium of a salaried secretary or otherwise, is optional with the members. It would, of course, cost considerable to carry it on, but it will get results. The present condition of affairs is costing us a great deal more through the business we lose, and we are not getting the results that we are justly entitled to.

However, the time is ripe and the conditions were never better nor the association in better shape, nor the need of it so great, and I repeat that I believe it to be the most important thing to do this year.—*Paper read by C. A. Laubach before the Iowa Convention.*

THE RIGHT ATTITUDE TOWARD THE INTERNATIONAL ASSOCIATION.

YOUR attitude toward the International association will, of course, be determined by your own individual viewpoint. The result will be a number of different and possibly antagonistic opinions. However, there are certain things concerning which all will agree. One is that the condition of efficiency everywhere is the assumption of proper attitudes toward all persons and organizations with whom we must necessarily deal. Failing of right relations to others, things are out of joint and cannot run smoothly and effectively.

With regard to the question of rightly relating ourselves to the International association, it seems that the questions involved are so numerous and complex that they cannot be properly solved by those not specifically charged with that duty. I, therefore, believe that our state should have a committee composed of two specially chosen or appointed members and our president, who shall act as chairman of the committee. Such a committee should be charged with the special duty of using their influence in directing aright the affairs of the International association. By advising continually with the splendid officers chosen from the best men in the state associations, as was done in January, great advancement could be made in bringing us into closer touch with the larger organizations. To work effectively, this committee should be well informed as to the affairs and conditions and needs of our own state. They should keep in touch with, and receive confidential counsel from all members of our state association. As to specific plans and policies, great freedom should be allowed, but the acts and purposes of the committee should be made public in so far as publicity will serve in attaining the desired results.

In order to bring our state into greater prominence at the International convention, I suggest that the committee take upon itself the duty of providing a uniform badge or bar-pin, inscribed with the word "IOWA." This badge should be given to and worn by every delegate and Independent telephone man from our state attending the International convention. The result would aid in sociability and would show the preponderance of Iowa men in attendance.

It is my opinion that such a committee should be appointed by this convention, and that it should be organized to make all necessary arrangements for Iowa headquarters at Chicago next year. It will be impossible and unnecessary to prescribe further duties, but that does not imply that the committee will find but little to do. As they work from year to year, new duties and opportunities for service will appear. Without doubt such a committee would soon discover work that must be done if Iowa is to assume her just place and power in the International association in the future as she has in the past.—*Paper read by J. C. Thorne at the Iowa Convention.*

RIGHT ATTITUDE OF A RURAL TOWARD A LONG DISTANCE COMPANY.

IT is my wish that we as local rural and long distance companies might adopt this for our motto, viz.: "Each for the other and all together." And I believe the day is coming when we will work under such a motto, or at least to some extent have that feeling towards each other.

In this county, too many rural lines are rather against any extension or consolidation, and until they try to perform duties beyond their own few miles of line, they will be slow to awaken to the subject. Life is what we make it and so is the life of every organization what its members make it. In business life, as in the individual life, we must go up or down, we cannot stand still. If we wish telephony to grow and prosper to its fullest extent, each one of us must make its interests our interests.

The most important thing for a rural company to consider is how many different plans are possible for the complete develop- of the telephone business.

It is quite generally conceded that telephone service to be most valuable must reach all the places and all the users that it is possible to reach. Now, it seems fair to conclude that whether there is one system or more, every system ought to reach all the places and all the people wherever telephones are used, if it is to be worked out to the fullest extent of the possibilities. This means that a telephone system to be most satisfactory, must act as a unit throughout the whole country. It seems fair, therefore, to conclude that in order to have a complete system, there must be complete agreement as to the policy, the plans and the purposes of the smaller parts of the greater system.

Of course, if one great corporation owns, controls and operates all the smaller parts of the greater system, there will be but one policy, one plan and custom. But it was against this one ownership, one policy and one plan of business that rural companies and all other companies in opposition to the Bell system were organized. Does it not seem reasonable that the rural companies must choose for themselves whether they will again put themselves at the mercy of one great company for their long distance connections, or work out for themselves with their neighbors, a plan whereby each can operate locally with absolute freedom from outside interference while interchanging long distance communications upon a fair and mathematical basis?

Is it possible that any rural company or member of any rural company could either desire or hope for telephone service at less than what it actually costs through the period of years that it is used? Now, if there is already in existence an organization which declares as its object, and provides in its plan, that every locality that wants its service at cost shall be defended in its right to operate as it pleases, and shall also be defended in the right of changing with its nearest neighbors as well as with the most distant point, upon a basis determined by majority vote where the smallest company has the same voting power as the largest company, can the opposition of any rural line be based upon a reasonable hope of ever securing an opportunity of fairer treatment?

Is not the small amount of opposition to the present Independent movement, which it must be acknowledged is being mani-

fested by certain rural lines, due to the fact that the organization has neglected to inform the rural lines of the real object and the particular workings of their plan? I think so. Many rural lines believe in free exchange to every one, and some go so far as to refuse to connect with lines doing a toll business. But they are rapidly finding out that they cannot continue their own line, say nothing about extension or repair, without some income, or in other words they are learning that they cannot give service unless some one pays for it.

Free exchange between two or three exchanges in a neighborhood is unfair because some of the members get far greater benefit than others. The ones that use the service every day and many times a day compel the other members who use the lines only once or twice a month to pay a far greater amount than is just and right for six or twelve connections a year. With free exchange, it is necessary to assess all members alike from time to time to pay expenses for repairs, making some pay excessive toll for the service they have, in order to benefit the few. The Independent long distance companies build good lines and keep them in repairs, and are entitled to a certain amount of protection from the farmers in order to enable them to maintain their lines, and the farmer cannot afford to mistreat them and cut off their connections unless they wish to bring about the condition that existed all over the country prior to the Independent movement.

Allow me to read one article from the constitution of the Iowa Independent Telephone Association, viz., Article 2: "The aim and purpose of this Association is to cement together in a firmer union all Independent non-Bell telephone interests in the state of Iowa, for the purpose of promoting uniformity of operation, maintenance and construction, to protect and defend all Independent telephone interests by moral effect, co-operation and such available means as may be deemed advisable." And as I read the entire constitution, I find that any of the rural lines are entitled to a membership, and they should all take advantage of the opportunity and have some representative attend the meetings, exchange ideas with and benefit by the knowledge they could derive from those better conversant with the best methods of operation.

The rural lines in the jurisdiction of this association are almost invariably dominated by the spirit of the Iowa farmer. It must be remembered that he cannot be driven, that he is jealous of his rights, and suspicious of propositions with which he is not familiar. It must also be remembered that there are principles involved in the telephone business not easily understood; things that now seem simple to the veteran telephone man once puzzled him as much as they puzzle the rural lines.

But it can be safely said that when the Iowa farmer is once thoroughly convinced that the Independent telephone movement means what it says when it proposes to defend him in the absolute freedom and to give him the "square deal" concerning all other matters, his friendship for the movement is worth all it cost, because it cannot be bought by anyone at any price.

May we all so conduct ourselves in our relations with one another and put forth our best efforts that the tendency of all will be upward and onward, that peace, harmony and success shall be ours.—*Paper read by C. A. Plummer at the Iowa Convention.*

THE RIGHT ATTITUDE OF A RURAL COMPANY TOWARD A CITY COMPANY.

ONE of the first things that strikes my mind concerning this subject is that, in order for any two companies to have right relations, both of the companies must be right to begin with, whether they are two rural companies, two city companies, or one rural company and one city company. And in order to be right, neither of the companies must want more than is right.

Our company has connections with two city exchanges. With one of them we built half way, the city exchange built half way. We charge a ten-cent fee, each of the companies taking one-half of the total earnings of the joint line. With the other city exchange we own none of the line, and on the business between our exchange and that exchange we get one-quarter of the total earnings.

There has been so much said in our locality about fair exchange, or the "square deal," being better than the free exchange which was the first plan of the rural companies, that it seems to me to be a useless repetition to mention again the fact that in our locality the rural companies consider free exchange out of date.

One of our experiences might be of interest to other rural companies who have not yet met the same conditions but who may meet them some time in the future.

The question of what to do with the man half way between two or three towns has troubled us some, and we have found that there must be very careful consideration and a definite understanding between a rural company having 300 subscribers or less, and its neighboring city company having 3,000 subscribers or more, if the patrons of the one company along the border line are not to be made dissatisfied by the patrons of the other company along the same border line, or by other representatives of the other company.

There are a number of things which not only can occur, but are apt to occur without any intention on the part of either party, but tending to arouse suspicion, dissatisfaction and even war, unless there are cool heads and honest intentions leading the movement on both sides.

For instance: If you were the manager of one rural company and endeavoring to satisfy 300 patrons with the service your exchange was originally built to supply, and had for your neighbor an exchange operating about 3,000 telephones, and your neighbor would supply at less than cost, telephone poles or telephone wires, or would make a place for the wires on its poles, to such of your members as wanted to change over from the rural to the city service, you would probably feel that you had good grounds for complaint, even though the said company pleaded ignorance of any intention to do you or your company an injury.

On the other hand, if the same city company tried to prove its good will to your company by acting as a supply station to your company, selling wire or batteries or any other material you might want at its Chicago price, and forgot to add the freight or any other item of expense, you might see the force of the argument a little later if the superintendent of that company should tell you that it was impossible for him to bear the expense of ordering your supplies and keeping them ready and keeping the accounts and letting you have them just when you wanted them if your company was going to use the cheapness of its operation as an argument for discouraging the patrons of the other company. And he might try to show you that the difference between what your rural company was compelled to charge and what his city company was charging was partly explained by the advantages you had been enjoying at his company's expense. He might also try to show you that when he sold the poles and the wire and gave the room on the cross arms to your neighbors, he had forgotten that there was a difference between being good to your company and being good to individual members of your company.

When the railroad commissioners compelled the rural companies to rebuild their lines over railroad crossings and the rural companies asked the city companies at certain points to put the rural companies' wires on the city companies' poles over the railroad crossings, another saving was made for the rural company.

Some might think that it cost the city company very little to give this accommodation, and that the city company should not have the rural company's sympathy or support unless it would be willing to be accommodating, which may be true enough; but if the rural company keeps down its cost by such accommodations, would it be fair for the same rural company to go about bragging how much cheaper it can give service to 300 patrons than the city company can to a larger number of patrons?

Besides all this, we have learned that it pays to be good in the telephone business. We believe our neighbors in the city companies have learned the same lesson. We believe that it is right for the city company to show the patrons of the rural company with plain, simple, honest arguments that they cannot expect to get the larger service of the city company at the smaller rate of the rural company, but that so long as they want the low rate of the rural company they must be satisfied to pay the ten-cent fee every time they call the city exchange. We believe it is just as necessary for the rural company to use its influence to convince the patrons of the city company that the larger service can only be given at a higher rate, and that if they want the smaller rate they must be satisfied with the smaller service. We believe that satisfaction to telephone users is being delayed in many localities because the leaders in the business do not understand that managers of neighboring exchanges should work together instead of working against each other.

I am quite sure there are not many managers of mutual companies who ever expect that there will be free exchanges between Des Moines and Dubuque, or Council Bluffs and Burlington. They just have their own locality in mind. They overlook the man just beyond who is interested in the town just beyond also. Therefore they overlook the fact that unless free exchange is limited somewhere it would have to take in the whole world. As soon as this fact is faced, the other question must be answered: When shall we place the limit? We tried it nearly every other way first. Finally we had to come to the "square deal," or fair exchange plan, and limit the flat rate service as nearly as possible to one exchange; then charge a message rate to all other exchanges.

That method makes it unnecessary to have rules as to what is important and what is not important, or who shall use the line first and who shall use it last. The man who pays talks, and the man who doesn't pay doesn't talk. The pay can be used for making as many lines and hiring as many operators as the talkers may need.

That plan makes every patron choose the service best adapted to the place in which he is living whether it is in town or in the country, because it is a fact in the telephone business that the largest use of the service is in the locality nearest to the user.

In closing, I can only say that in my opinion the right attitude of a rural company or exchange toward a city company or a city exchange is to be fair, to be kind, to be wide awake, to be active, attend the meetings of the associations, read the telephone publications, keep the members of its company interested, and bear its part of the burden and the difficulties in working out one great

harmonious independent system.—*Paper read by F. R. Decker at the Iowa Convention.*

SOME EXPERIENCES OF A RURAL TELEPHONE COMPANY.

OUR first experience in the telephone business was figuring how we could get service. In the first place, the Bell company wouldn't and the first commercial companies couldn't furnish service for all of the farmers and smaller towns as fast as it was demanded. Besides that, the builders of the first commercial lines talked so much about the big profits they were making out of their business that farmers naturally began to inquire why they should be called upon to pay the big profits to the commercial companies.

I believe that if the larger companies had been able to furnish the service as fast it was required and had been willing to charge the same rates, or rates even a little higher than they are now charging, there would have been very few mutual or farmers' companies organized.

One of our first experiences was that of finding out that there were many more details to the business than we had at first expected, and that the business required much more attention and time than we supposed. In order to keep down the cost, the attention and the time were given by one or more members of the company without keeping any track of it, and without making any charge for it. For that reason the cost, as shown by the figures of most rural companies, does not include all of the actual cost of keeping up the service. I saw recently a letter from one of the leaders of one of the oldest of the rural companies in Iowa in which it was stated that the writer had used $200 of his own means for the benefit of his company without making any charge for it, and I know a number of other rural companies where the low cost of the membership can be explained by similar contributions of time and money on the part of the leaders who made no charge for either.

Another of the experiences which we have had is that our natural tendency to keep down the cost at the time of building, as well as the cost of operating, is in certain ways proving expensive rather than economical because of the repairs and the strengthening of the lines and the equipment which must now be made, but which might have been avoided if we had known better at the beginning. But I think the city companies also made a similar mistake in their efforts to build at low cost rather than economically, so that we should not complain more than our neighbors on that score.

As we developed in our experience we found that it was almost an impossibility to have a strictly mutual company. Many people who wanted telephone service refused to buy shares. Therefore, it is necessary to give the service at a fixed yearly rate, and that raises the question of rates for service on a commercial basis. We had to begin adopting business principles and face the question of what was a reasonable and safe rate for telephone service. In common with most of the rural companies of which I know, we adopted the rate of $12 per year, or $1 per month.

The question of how collections for the monthly exchange service and the toll charges should be made is one that is now perplexing many rural companies. With the old pay-as-you-please plan in operation, it was hard to keep the books straight; and those who are carrying the heaviest portion of the real business affairs of the rural companies are being forced to see that there must be some better method, some cheaper way of making the collections.

This question of collections combines itself with another question that is bothering most rural companies, and that is: How far can a rural company safely build in order to give service to what we call a renter subscriber who pays by the year and does not buy stock? How much must he pay in advance at the time the service is put into effect, to make sure that the rural company will not be the loser on his account?

I have heard of a rural company in our vicinity that is generally believed to be successful and well managed, that discussed at a recent meeting of its directors whether it could safely run a wire a half mile in order to connect up a man who had rented a farm for three years and who would agree to take three years' service at $12 per year in the rural or mutual company in question. Some of the directors of the mutual company argued that, inasmuch as it would take about $36 to provide the telephone, the labor, and the material to connect him with their system he should not be given service unless he pay three years, or $36 in advance. This company has nearly 400 members and rural subscribers and operates one exchange in a town of about 800 inhabitants. This instance is one of the many evidences of the fact that the minds of farmers and others interested in rural telephone service are changing somewhat from the extreme view that was unintentionally given them by the first builders of the larger companies who went about selling shares and arguing that the profits of the business ranged anywhere from 15 per cent to 40 per cent per year on the capital invested. The rural companies are finding out that they are not making anything like 15 per cent profit on the telephone they "rent" for $12 a year; and the man who attempts to collect the $12 in $1 installments, or at the rate of $1 per month is easily convinced that if he charged for his time of collecting and keeping the books there would hardly be enough left in some instances to buy the batteries that the $1 a month man uses up during the year, to say nothing of interest on the investment.

The rural companies generally are just now experiencing deeper interest in the question of what is the right rate to charge and what is the cheapest way to collect for telephone service. I believe their experience is making them feel more friendly toward the city companies as they are finding that their first conclusions, even though they were the result of the arguments of the first builders of the city lines, were wrong; and that the rates that the city companies are now charging for service in town or for service on the rural lines, are not the "robber rates" they once thought they were.

The amount charged each member for shares of stock in rural companies usually ranges somewhere from $20 to $60 each, or an average of $40 each; and the assessment usually made for keeping up the central office service is generally from $2 to $6 a year. So far as I have been able to judge, I think one cent a day, or about $3.50 a year, would be the average of the assessments for rural service. I think that the rural companies that have been longest in the field are gradually reaching the conclusion that their assessments have been too low rather than too high. In fact, I understand that a rural company recently organized, and just now about ready to begin operation in our part of the state, has not only avoided the expensive cheapness of the farm companies in the building of poor lines by building their lines at higher cost, but as I believe in such manner as to keep down the cost of their service. But as I understand they have also decided to begin their assessments on the basis of about $6 per year, so as to avoid the necessity of raising them later. It would seem that an assessment of $4 per year would be about as low as the average company could hope to make it.

Another experience that is coming to the rural company is that of meeting the fact that telephone poles rot off and telephone wires rust out just as fence posts and fence wires do, and that there will come a time when they will have to rebuild their telephone plant just as they have to rebuild their fences. This compels all who think seriously of the business to see that the talk about depreciation is not all moonshine.

If we allow for rebuilding the lines in ten years, or a depreciation of 10 per cent on $40 per member, we have an item of $4 to be added to the assessment for the central service of $4; and if we take into account the additional item of 6 per cent interest for the use of the $40 invested, we have a total of $10.40 per year, without making any allowance whatever for management expense. And the man who has put in his time looking after everything that every one else neglected even in a small rural system, is in a position to know that even though the members are not required to pay anything for management expense, it is nevertheless an expense, and is borne by some person or persons, whether the majority of the members know it and appreciate it or not. I think I am safe in saying that I can name a dozen or more men in as many rural companies of my acquaintanceship who, during the last five years, have given enough time and ability without charge to their several companies to amount to an assessment of $1 per year for each member.

I believe, therefore, that $12 a year paid in advance is the lowest possible amount that any small rural company should accept from non-members for its service, because, when we take into account the risk the members themselves are taking in the form of lightning in the summer time, and sleet storms such as we have had through portions of Iowa this year, in the winter time, the margin between the average cost and the $12 rate is more apt to be a loss than a very large profit.

Another experience rural companies have had is the strife for territory which they at first thought was caused only by the determination of the larger companies to monopolize everything as a natural tendency of the business rather than of the builders of the business. This is especially true so long as the free exchange idea, which promises so much but really amounts to so little, is persisted in, as it naturally is at the beginning of almost every rural movement.

We have found that the only way to settle the question as to where the territory should be divided between two neighboring companies, or between a rural company and a city company is to adopt the fair exchange or "square deal" plan.

By giving each member or patron service on a yearly basis or flat rate through his closest exchange and a 10-cent switch to every adjoining exchange, all questions of division of territory settle themselves naturally, and this is the only basis for peaceable operation that we have been able to find.

It has been said that all difficulties in the rural telephone business are caused by mutual suspicion, or by neglect, or by incompetence. It is a fact that in the first place we were extremely suspicious of the larger companies because we thought that we would be called upon always to compete with them and our ability to compete would be in proportion to our size as contrasted with their size. It is possible the larger companies had equal dread of

our ideas of free exchange. Under these conditions any one who was wise would naturally be suspicious, but the conditions have changed and a new day is dawning or has dawned. The city lion and the rural lamb are now lying down peaceably together in many localities, and a little child can lead them.—*Paper read by G. A. Evanson at the Iowa Convention.*

THE MANAGERS' ASSOCIATION.

IN the early part of 1906 the Citizens' Telephone Company of Grand Rapids, Michigan, by its general manager, C. E. Tarte, called a meeting of its managers at Grand Rapids, inviting its salaried and some of its commissioned managers, as well as a few from nearby connecting companies, for the purpose of getting them acquainted with each other and discussing the various details and policies of the routine of Independent telephone work.

The meeting was so very satisfactory and the possibilities for good to be accomplished so great that those present employed by other companies, desiring to have such advantages as the managers of the Citizens' Telephone Company were enjoying, expressed their desire that the plan be enlarged and broadened to include the whole of Michigan, and let every Independent telephone manager and those connected with the routine work of Independent telephony gain the benefits to be derived.

A committee was elected to take up this matter and inquire into its advisability, and get the opinion of the various companies, or their general managers, as to whether such an organization would meet with their approval. As the sentiment was very much in favor of such an organization the committee got together and prepared a constitution which they thought would meet with approval, and called a meeting for the purpose of adopting the constitution and organizing and electing the officers of the Independent Telephone Managers' Association of Michigan.

In answering the question, "What is the Managers' Association doing?" I would first call your attention to some of the sections of our constitution:

ARTICLE 2—OBJECTS.

To discuss papers and subjects pertaining to the operation, maintenance, accounting service and interchange toll service, etc., of Independent telephone companies. Also for the purpose of exchange of ideas, experiences, etc., which may be of value and assist members to improve and broaden their knowledge of Independent telephony.

ARTICLE 8. SECTION A—ACTIVE MEMBERSHIP.

Any employe of an Independent telephone company operating in the state of Michigan, and who shall hold a position of manager, wire chief, chief troublemen, or head of any department, or be engaged in the routine work of telephony shall be eligible after such application for membership has been passed upon favorably by the Executive Committee, and endorsed by the company by whom applicant is employed, and upon payment of the annual dues in advance.

ARTICLE 8. SECTION B—ASSOCIATE MEMBERSHIP.

Presidents, secretaries, general managers and all other persons employed in the field of Independent telephony, shall be eligible to associate membership upon favorable action by the Executive Committee, but no associate member shall have the right to vote upon any question in connection with the management of this association.

ARTICLE 14—MEMBERS OR OFFICERS CEASING TO BE INDEPENDENT.

Any member or officer becoming in any way connected with other telephone interests than those identified with the Independent companies shall be regarded by the Executive Committee as having tendered his resignation to said association. Any one becoming a member of or accepting an office in this association does so with the above understanding, and the Executive Committee shall in case of resignation or death of officers, appoint their successors until the next regular or special meeting of the association, when the vacancies shall be filled.

The prime object of the officers and executive committee so far has been to get the members, and then get them busy writing papers to be read before the association which are subject to discussion, and get them to discussing them (which is being done). I can assure you that there have been some very animated and instructive papers and discussions on various branches of our work—such as the Owosso meeting where the whole time of the meeting was devoted almost entirely to the operating room and when many good ideas were brought out by the lady managers, chief operators, and toll line operators who prepared and read papers upon the various topics assigned.

And again at Battle Creek, where we held our first annual meeting and very thoroughly discussed the trouble proposition—central office, telephone, line and toll line—how to locate the trouble and what to do after locating it—and there is no doubt that all present gained some good. And we expect to keep on doing good of this kind by bringing out the best and when any one has a good thing let the rest of us have the benefit so that we may have a more uniform practice in use in the detail of our business. And detail is one of the points that the Michigan Managers' Association is striving to bring out, as they have no desire whatever to take up the political side of telephony or in any way conflict with your state association of companies.

We strive to keep the association in the Independent field only and want all that are eligible to join and pay their share of the expense of the association, which is very small. But we want the money so that we may have money to spend for the benefit of the association and its members and will say right here that the Executive Committee of this association has and is now trying their best to give each of its members from one hundred to two hundred per cent on every dollar that they pay into the treasury.—*Paper read by William Robinson before the Michigan Convention.*

COLLECTIONS.

THIS subject must be considered from the standpoint of the two customs in vogue at present. First, the giving of discount to the subscriber for advance rental payments. Second, the collection of rental accounts where no discount is allowed. The discount plan is being adopted by new companies because their schedule of rates is such as to permit it. Then, again, they profit by the experience of the pioneer companies and realize that the public pay more promptly if they believe they are saving money by availing themselves of a discount. The discount plan usually has the effect of putting all subscribers on an even footing and gives better results. But even with the discount plan, it is not all serene. You must, under this plan, have the proper supervision, records, and methods to enforce collections. Gas and electric light companies even find it necessary to maintain a collection staff to enforce collections. Subscribers often believe if they do not take advantage of the discount they should be extended credit until the expiration of the quarter.

When the pioneer companies were established the vital question was subscribers, but are not collections equally important now? In the early days habits were formed by the subscribers of paying when they saw fit. We all realize what up-hill work it is to change customs; many companies' present rates would not permit of using a discount scheme, hence the importance of a proper collection system. The first essential is the education of the subscriber that payments must be made promptly. The education should start when the subscriber signs the contract by having the solicitor or contract agent secure a deposit of the first quarter's rental which is credited on the subscriber's rental account.

The Citizens' company of Grand Rapids has adopted this rule. Printed in bold type on the contract just over the place for the subscriber's signature is the rule regarding deposits. We often find it is not necessary to request the deposit, the subscriber taking the hint from the printed rule. In the exchanges of the Citizens' company a notice is displayed in a conspicuous place quoting this rule. The first three months that the rule was in vogue in the Grand Rapids exchange we collected a large per cent of the deposits on new applications. Only five applications were rejected in that period owing to the inability to pay deposits. Is not our investment sufficient that we, like the commercial house, should protect it by sorting out the unprofitable business? Then, again, the subscriber cannot deny acknowledging the rule regarding payments to be made in advance. We have gone a step further; on the contract is noted by the solicitor what information can be obtained regarding the subscriber's occupation, financial condition, or any information that will later assist the collection department. If the solicitor cannot secure satisfactory information we sometimes secure the local credit company's references. This is later transferred to a card record maintained in the collection department. Good service is essential and funds are not spared to hire experts to maintain and improve it; but the matter of collection is too often delegated to inexperienced and incompetent help, because it is thought that anybody can become a collector, that it is easy work. When you hire operators, you consider their qualifications. Why not the collector? Who comes in closer touch with your patrons than the collector? Here again is where education plays an important part. If the patron has any complaint it is usually forthcoming when the collector calls for payment. Even if your business requires the service of only one collector he should be a competent one. A competent man should likewise be in charge of the collections. Like the credit man of the commercial house he should provide the proper records, system, and methods to enforce collections. It is easy to gather in sugar plums, but, Oh, how hard it is to force the habitual slow payers to settle! Here is where the qualification of competent help asserts itself. It is no easy task to decline to grant extension of payment, because to be firm you may have to refuse your best friends.

As previously stated, we maintain a card system of the information obtained by the contract department, giving the subscriber's financial condition, occupation, etc.; to this later is noted when payment is made and other valuable information. Thus fortified we soon learn of those who need urgent attention; as a rule you find who are the perennial delinquents. After sufficient notice has been given the subscriber that payment must be made or the service will be discontinued, if an individual line is leased it is connected to a board located in the collection department. When subscribers make an out-going call they are usually informed that they

are in arrears and some adjustment must be made. The incoming service to such subscribers is not disconnected unless the first method is not successful in securing payment. If a party line is leased the instrument is removed, not disconnected.

Every effort is put forth to stimulate and improve collections. The daily totals are posted on the bulletin board in the collection department. Meetings to talk over details are held regularly with the collectors and the manager of the exchange. As a result of this policy we boast of a lower outstanding this quarter at our Grand Rapids exchange, notwithstanding the financial depression we have passed through, than ever before. Our records show that we collect about seventy per cent of our outstanding accounts the first month in the quarter; at the end of the second month we have collected eighty-two per cent, and with the expiration of the quarter we have outstanding but three and a half per cent. From May 1, 1907, to date, we have discontinued but 55 telephones at the Grand Rapids exchange for non-payment, a monthly average of about four. At the outside exchanges equally good results have been obtained. We estimate the cost of making collections at Grand Rapids as slightly in excess of two per cent. Our losses last year were but one-tenth of one per cent on uncollectible bills.

Each collector is provided with a route book of his territory in which is noted a record of all accounts due. This is arranged according to the location of the subscribers. It is the duty of the collector to keep this posted to date. With this scheme he is properly equipped. A record of appointments is made and filled in the dater in the collection department. These are retained in the office so the results can be checked by the person in charge of collections.

Our good showing obtained serves to draw attention to the importance of regularity in handling subscribers' accounts. The arrangement of bills according to routes which are not changed from time to time, and are always covered in the same order, is probably one of the principal reasons for the satisfactory results which have been secured in reducing the number of delinquent payments. Subscribers learn to expect the collector at a time which may be determined almost exactly, and are more likely to be ready to make their payments than if presented with a bill after an unsettled or irregular interim of waiting. Especially in the matter of residence telephones they are able to adjust their various payments on household accounts so that the telephone company's bill is taken up each time in its regular turn.

When payment is not made at the first call, a promise to be ready on a certain date is usually obtained, and the telephone company is still able to maintain the impression that it looks carefully and promptly after its business.

Other advantages to the company very evidently result from what may be termed an increase in the daily efficiency of the collectors. Not only do the collectors themselves benefit by having such a routine, but it is very easy for the officials of the company employing such a system to keep close check on the work of the men. The collector's book system of keeping records, as compared with other methods of handling collections in which a regular route is laid out, possesses the additional special feature of making it possible for men to keep more closely and permanently in touch with their work, as in handling any particular case they have in their possession records which furnish them with complete and accurate information concerning the past indebtedness and payments of the subscriber.

Another item not strictly in the line of collections, but one that affects our revenue, is the expense we are put to by moving telephones to different locations. It is right and proper that we should charge for the moving of telephones; no other public utility or business concern is requested to go to such an additional expense without compensation. We charge our subscribers $2 for a change of location, and for labor and material, not to exceed $2, for inside moves. We are very careful to see that the orders for such a move are sent in in writing on the removal blank that is inserted in the directory. Thus we have been able to considerably reduce the expenditure that was a burden, and one we should not be asked to bear.

Another item of revenue is, the charging of $2 rental per annum for desk telephones in residences. This has had the effect of discouraging the installation of desk telephones in private residences, which is to our advantage.

Another by-product is the placing of advertising in exchange directories. In many instances we not only have saved the cost of publication but realized a profit.

To be successful in your collections first enforce the rule that requires a deposit of the first quarter's rental and ascertain the prospective subscriber's financial standing—thus verifying the old adage that an ounce of prevention is better than a pound of cure; second, maintain such records that you will be in a position to know your subscriber's habit of paying, and any other information to keep you constantly in touch with the collections; third, employ competent men to make the collections. This will stop the most serious possible leaks of uncollectible bills.—*Paper read by F. V. Newman before the Michigan Association.*

Digest of Telephone Literature
Conducted by E. M. Rothelle

[This digest includes the telephone articles printed in technical and scientific publications in all civilized countries. It is a complete index to the world's telephone literature. All publications are given numbers. The title appears first followed by author's name, number and date of publication; for example: 122-1-25-08 is Electrical Review of date January 25, 1908. Those desiring any article in this digest should address the publication whose key number is given below. The publications reviewed in this issue follow.—Editor.]

104—Western Electrician, Chicago.
111—Western Telephone Journal, Vinton, Iowa.
115—Electric Club Journal, Pittsburg, Pa.
121—American Telephone Journal, New York.
122—Electrical Review, New York.
125—Electrical World, New York.
133—The Transmitter, Weatherford, Texas.
135—Canadian Elect. News, Montreal, Canada.
141—National Telephone Journal, London, England.
142—Electrician, London, England.
143—Electrical Engineering, London, England.
144—Electrical Engineer, London, England
146—Electrical Review, London, England.
161—Schwachstromtechnik, Munchen, Germany.
163—Electrotechnischer Anzeiger, Berlin, Germany.
171—Royal Telegraph Bureau Report, Stockholm, Sweden.

The Telephone Situation from the Bell View Point. Theo. N. Vail. 104—4-4-08. This is an abstract from the annual report made by the president of the American Telephone & Telegraph Company. Mr. Vail looks at the situation from the Bell standpoint and his line of reasoning will be of interest to Independent readers. He discusses rate and rate regulations, as well as competition, public control, fair return on capital, toll line and long-distance service, and concludes with a brief discussion of the important element, maintenance.

Improvements in the Audion. 104—3-28-08. Lee De Forest has invented an interesting arrangement used particularly in wireless telephone and telegraph experiments and a general description of an improvement in the device is presented.

Telephone Accounting. G. R. Fawkes. 111—4-1-08. Long-distance business is discussed in this, the seventh installment of a series of interesting articles upon telephone accounting. A number of forms are presented in this issue.

Some Facts Concerning Cancelled Toll Calls. C. H. Coar. 111—4-1-08. This discussion covers the principal reasons for cancellations and suggests methods of reducing the loss through occasion of toll calls.

Protective Relays. M. C. Rypinski. 115—4-1-08. In the present installment of this article a polyphase alternating current relay is illustrated and described together with a diagram and chart showing by curves the operation of overload relays with inverse time element action.

Circuit Interrupting Devices. F. W. Harris. 115—4-1-08. This is the concluding installment of a series of ar-

ticles upon circuit interrupting devices, and covers chiefly carbon break circuit breakers, discussing their operation, installation and care with a brief concluding paragraph upon probable future developments.

Protection of Electric Circuits and Apparatus from Lightning and Similar Disturbances. R. P. Jackson. 115—4-1-08. This series of articles has been referred to before, and while it pertains particularly to the protection of electric lighting and power circuits, interesting points are touched upon, which it may be well for the telephone worker to study. In discussing the grounds for lightning arresters, this feature of the work is considered very important, for poor ground connections will render ineffective every protection against lightning that may be placed upon a circuit. The specifications for producing the earth connections are as follows: "First, dig a hole four feet square directly under the arrester until permanently damp earth has been reached; second, cover the bottom of this hole with crushed coke or charcoal (about pea size); third, over this lay ten square feet of tinned copper plate; fourth, securely solder or rivet to this ground plate a wire, preferably No. 0 copper, across the entire width of the plate; fifth, cover the ground plate with two feet of crushed coke or charcoal, and sixth, fill the hole with earth, using water to settle it. The above method of making a ground connection is simple, and has been found to give excellent results, and yet if not made in proper soil, will prove of little value. Where a mountain stream is conveniently near, it is not uncommon to throw the ground plate into the bed of the stream; this practice results in poor ground connections owing to the high resistance of pure water and the rocky bottom of the stream. Clay, even when wet, rocks, sand, gravel, dry earth and pure water are not suitable materials in which to bury the ground plate of a lightning arrester. Rich soil is the best." Of course, the ground plate connections need not be made with a No. 0 copper wire for telephone installation. A No. 10 copper is of sufficient size. The suggestions, however, are in other respects applicable to telephone installations.

A Self-Auditing Collection System. E. C. Blomeyer. 121—3-21-08. This article is written with a view of pointing out a way in which many errors usually made in making out and collecting bills may be largely avoided. Different card forms are given.

Preventable Cable Troubles. V. E. Furnace. 121—4-11-08. This is the first installment of an article discussing cable troubles in general. After referring to certain methods through which breaks can be located quickly, it is stated that to repair pot heads usually calls for spending two hours' time and another eighteen hours for finding and cutting in the new head, to which it is necessary to add fifteen dollars for the fifty pair pot head and material. Attention is drawn to the danger of permitting cable men to use the loops of the cables for steps when entering and leaving the manholes.

Local Operating Room Records. K. Weisiger. 121—4-11-08. The author has presented numerous articles upon this interesting subject and at present discusses the same subject in an interesting manner, card records being given most attention. The series is to be continued.

Comments on Operating Room Control. J. Putnam. 121—3-21-08. The article chiefly discusses the general use to which marked plugs may be put in connection with switchboard spring jacks. The following system is suggested for an office not requiring too great a variety of service: Single wire—no mark; party line—code ringing, light blue dash at lower left-hand corner; party line—selective ringing, orange dash at upper left-hand corner; free connection—red stripe to right of jack; reference to bulletin—white stripe above and to right. The article also briefly touches upon general suggestions which were made by a previous author in connection with operating room control.

Telephone Train Dispatching. E. J. Burke. 122—3-2-08. In a short article the author discusses the general nature of problems which one is required to meet in connection with the installation and operation of the train dispatching system.

Some Early Telephone Journals. F. DeLand. 125—3-14-08. Mr. DeLand, who has given considerable attention to telephone publications, gives an interesting sketch of the different telephone journals which have been published from time to time since the early days of the telephone art, and it is interesting to observe how thoroughly the idea of publishing a telephone journal was discouraged by the Bell companies. It is stated that one of the first periodicals entitled *Telephone* was issued in 1877. The *Telephone Record* was published in the summer of 1878. The *Telephone Journal* was published in Chicago in 1878 and in 1879 the *Southern Herald of the Telephone* was issued at Richmond, Virginia. The *Telephone Exchange Reporter* appeared in Cincinnati in 1880 at a subscription price of $4.00 per year, but only six numbers appeared.

Switchboard Troubles. Price Kiker. 133—4-1-08. A short, illustrated description in which switchboard troubles are briefly discussed. The same paper also presents an article upon a special trunking circuit by G. G. McPherson. The trunk circuit is adapted for service between local and long-distance lines.

The Wireless Telephone. 135—3-1-08. Lee De Forest recently presented an interesting paper upon the wireless telephone before the New York Electrical Engineers' Society. The circuits illustrating the principles of the sending and receiving apparatus are shown.

Criticisms and Suggestions on Underground and Overhead Work. C. E. Tattersall. 141—4-1-08. This is a brief discussion of the different features entering into the construction of underground conduits and also overhead line circuits, calling attention to construction and circuit material.

Some Possible Improvements in Wireless Telephony. A. Campos. 142—3-6-08. This is an abstract of a paper read before the L'Associazone Elettrotecnica Italiana and covers some possible improvements of the Duddell circuit as applied to wireless telegraphy and telephony. The original article consists of a brief review of the progress made in the use of the electric arc in wireless telegraphy and telephony, referring particularly to the Duddell and Poulsen systems. The possibility of obtaining a mechanically driven generator of a suitable character to produce undamped oscillations is discussed and found to be possible when using a dynamo of the series type, although great difficulties would still be encountered. The author concludes with drawing attention to the great need of mechanical means of producing electrical oscillations of a suitable kind.

Capacity of Cables. F. J. O'Howe. 142—3-20-08. The author discusses the errors arising in the measurements of capacity of cables by methods in general use. While in low tension cables such errors are unimportant, high tension paper insulated cables require more attention while making measurements. Results of investigations are covered which finally lead to the design of a combined bridge for resistance, inductance, and capacity test, the operations being much simplified. The article runs through into the March 27, 1908, issue of the same journal. Circuits and details of connections are illustrated in this, the final installment.

Telephone and Telegraph Cables. 143—4-2-08. This paper was presented by F. Tremain before the Institute of Electrical Engineers, March 23, 1908, and deals exclusively with paper insulated, lead sheathed cables. The article contains a number of suggestions and concludes with a report of the discussions.

The Future of the Telephone Service. H. L. Webb. 144—3-13-08. A short note claiming to show great advantages for measured service for telephone service. Mr.

Webb recites that thirteen years ago there were eighteen thousand telephones in use under the flat rate plan in Greater New York and that development was almost stagnant. Then when measured service was introduced and the private branch exchange systems devised, the number of telephones in use quickly increased until they now equal something over three hundred thousand telephones.

The New Gerrard Exchange of the National Telephone Company. 144—4-10-08. A full and interesting description of a 10,000-line capacity common battery telephone exchange is given. The board is built so that an ultimate space is provided for 9,520 subscriber lines and 1,520 outgoing trunk circuits. This refers to the A positions, 102 of which are installed. There are 47 B positions, taking care of 1,269 incoming trunk circuits. It appears the immediate capacity of the exchange is for something over 6,700 subscribers' lines with an average of 81 subscribers' lines per position, and 27 incoming trunk circuits per B position. The illustration presented shows the floor plan, main cross connecting frame and the different cable racks, as well as a general view of the main operating room and the testing equipment. The rear view of the switchboard is also shown. In discussing the volume of business dealt with, it is explained that 175,000 calls are handled in the course of a day, the total number of calls per hour equaling about 24,000 at the busiest periods. It is further suggested that something over seventy-eight per cent of the calls from this exchange must be completed over outgoing trunk circuits. A general description of the power plant is to be presented in the next installment of the paper.

The Design and Use of Telephone and Telegraph Cables. F. Tremain, M. I. E. E. 146—4-10-08. This is an abstract of a paper read before the Institute of Electrical Engineers and covers a discussion of both aerial and underground cables. The paper is of a very interesting character and should be read by everyone interested in the subject of telephone transmission.

Modern Galvanic Batteries. 161—3-1-08. An interesting discussion is presented describing several types of open circuit batteries, both of the liquid type and the so-called dry kind. Attention is drawn to the error of the generally accepted ideas that the higher the current output of the cell while making a quick test, the better the quality. It is suggested that in order to make a satisfactory test of an open circuit battery, it is necessary to observe the operation while nearly under its normal working conditions, it being found that many batteries giving from four to five amperes upon a short circuit give far more satisfactory service than such batteries as deliver twenty amperes of current upon a short circuit test. It is further stated that one should not regard the liquid in a battery as the exciting fluid. It should simply be a good electrical conductor. It is further explained that there is more danger of having too large a zinc surface towards the carbon electrode than making the zinc too small, for with too large a zinc surface the carbon is not of sufficient size for producing a satisfactory service. Great importance is attached to the method of fastening the binding screws to the carbon electrode.

Telephone Rates. 161—4-1-08. German publications have been giving considerable attention to the change in telephone rates with particular reference to changing from the flat rate to the message rate basis. The present article is a continuation of a general discussion of the subject.

Increasing the Self-Induction of Telephone Cables. 161—3-15-08. W. C. Jaetman appears to have invented a system of telephone and telegraph cables through which he intends to increase the self-induction by surrounding the copper wire with an iron shell and passing a continuous current through the wire so as to increase the magnetic effect. No report is made of the results of any tests which may have been made with this arrangement.

Telephone Switchboards for Railroads. 163—3-15-08. This is an illustrated article showing circuits and general arrangement of apparatus required for producing a compact form of switchboard. The lightning arresters are mounted in the upper portion of the board, while the switching apparatus consists of keys arranged in a proper manner with bus bars, relays, etc., for permitting any two lines to be connected at will. The switchboard is of the type which may be fastened to the wall. Main exchange trunk circuits are also provided for. The switchboard has a capacity for twenty lines and appears to permit of completing eight through connections at one time under certain circuit conditions.

New Long Distance Switchboard in Berlin, Germany. 171—1-1-08. An illustrated discussion is presented of a long distance switchboard in Germany. Circuits are shown and general details of construction are touched upon. The serial is to be continued. The first installment appeared some weeks ago.

CONSOLIDATED'S GOOD YEAR.

IN HIS annual report, presented to the directors of the Consolidated Telephone Companies of Pennsylvania, Charles West, of Allentown, general manager, showed that 1907 made a very satisfactory increase in earnings and decrease in operating and maintenance expenses per telephone over the year 1906.

A comparative statement of earnings for 1905, 1906 and 1907 is as follows:

1905—Revenue, $318,717.59; operation and maintenance, $160,069.05; net revenue, $158,648.54; fixed charges, $143,050.19; balance, $15,598.35.

1906—Revenue, $376,659.94; operation and maintenance, $200,129.35; net revenue, $176.530.59; fixed charges, $151,-984.09; balance, $24,546.50.

1907—Revenue, $427,305.55; operation and maintenance, $213.435.49; net revenue, $213,870.06; fixed charges, $158,-462.43; balance, $55,407.58.

Increase 1907 over 1906—Revenue, $51,645.61; operation and maintenance, $13,306.14; net revenue, $37,339.47; fixed charges, $6,478.39; balance, $30,861.08.

By the above figures it is shown that the net revenue of the company has increased from $24,546.50 in 1906 to $55,-407.58 in 1907. The increase in toll earnings for the year 1907 as compared with the year 1906 is $13,716.55. The net increase in the number of telephones installed during the year amounted to 1,907, as against 1,117 for the year 1906.

During the year the company completed the installation of a new central energy plant at Pittston with satisfactory results, and also the installation of the automatic system at Emaus. The Danielsville lines have been rebuilt and a new private toll circuit has been run from Lansford to Philadelphia. The Catasauqua exchange, which was destroyed by fire, has been rebuilt and installed in a new up-to-date building. The company spent for new construction work during the year the sum of $127,670.18.

Robert E. Wright was re-elected president, George O. Albright vice-president, C. M. W. Keck secretary and treasurer and Charles West general manager.

NEWARK'S PROSPEROUS COMPANY.

AT THE last meeting of the directors of the Newark (Ohio) Telephone Company, held at the company's office, it was voted to retire $5,000 of the bond issue, to pay the regular semi-annual interest on the bonds of three per cent and to declare the regular quarterly dividend on the common stock of two per cent. The report for the first two months of this year showed an increase over the first two months of 1907 of $1,200 in the gross earnings, with an increase of only $100 in the expenses. The affairs of the company were shown to be in a very flourishing condition, and considerable work is being planned for the coming season.

Questions AND Answers By H. P. Clausen

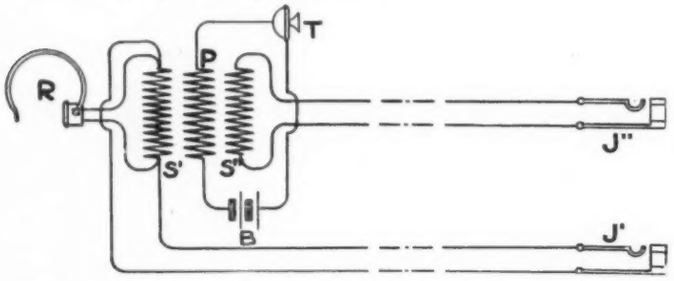
GROUNDED TOLL LINE.

WE ARE contemplating constructing a grounded line twenty-five miles in length and for the first fifteen miles the poles will carry five other branch lines branching off from the main line at different points. The one line running twenty-five miles is a toll line and the remaining lines are party lines. Do you consider this arrangement practical or would the induction between the toll and party lines be so severe as to prevent rendering a satisfactory class of service?—W. S. R., Minnesota.

The cross talk between your grounded lines and toll line will be very severe and we strongly urge that you make the toll line metallic—at least for a distance of fifteen miles, installing a repeating coil at the fifteen-mile point, if you can possibly find place for it in a suitable building. The repeating coil should be left so that you can get at it readily for the purpose of cleaning lightning arresters, etc. It will depend somewhat on the equipment upon the toll line as to what type of repeating coil you should order. If you are only required to throw a drop at the terminals of the line, then an ordinary "ring-through" repeater will give you the required service. This, however, is a matter which we could discuss with you after you give us complete information as to the equipment of the line and the terminal apparatus. In short, however, the use of a grounded line clear through is not considered an at all practical arrangement.

A MONITORING OPERATOR'S LISTENING CIRCUIT.

I have a switchboard of the local battery type and have connected each operator's set with a spring jack mounted in a desk in my office. I have my telephone set connected to a cord and plug so that I may place the plug into any one of the jacks and thus connect the telephone set to the operator's telephone circuits, thus permitting me to monitor the connections; but I find when I plug into the jack, the operator is able to tell when I do so and therefore it is impossible for me to secretly observe the service, for whenever I place the plug into the jack, the operator's transmitter comes right up loud. Is there any way in which I can overcome this difficulty?—J. F. McQ., New Mexico.



Referring to the sketch above, R represents the operator's telephone set, S' the secondary of the operator's induction coil and P the primary of the induction coil. The transmitter is shown at T and the battery at B. J' shows the spring jack, such as you now have connected to the operator's telephone circuit.

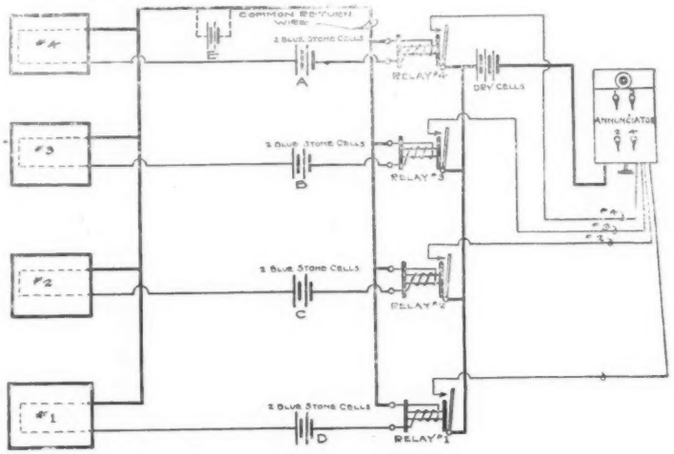
In order to prevent loud side tones in receiver R, when you listen in on the operator's circuit, install an induction coil having a third winding, S" placed over the outside of the regular windings of the coil. Connect this third winding to the spring jack, J", and you will not have any more difficulty with the operator being able to tell when you listen in upon the circuit.

You may take the same induction coil you now have in service and simply wind a few hundred turns of wire around the present coil, and you will observe that while you can still hear the conversation passing over the line, the closing of the special secondary circuit does not cause any noticeable increase in side tones in the operator's telephone.

This circuit arrangement, which is presented herewith, is being used very extensively and appears to be one of the best ways to accomplish the results aimed at.

PLAN FOR REDUCING NUMBER OF BATTERIES REQUIRED.

I am enclosing a plan of wiring for a closed circuit burglar alarm system. You will notice I have four stations numbered 1, 2, 3 and 4 and that each station has a relay connected with an annunciator. You will also notice that eight closed circuit batteries are being used for supplying this system with current. Will you advise whether it is not possible to reduce the number of batteries required upon this circuit?—A. R. B., New York.



It is unnecessary for you to have the four separate sets of batteries, such as you have indicated at A, B, C, and D. If you will insert one set of batteries at E, you may remove the four sets of batteries above referred to and not experience any difficulty in the operation of the system.

NO BOOK FULLY DESCRIBING COILS YET PUBLISHED.

Can you furnish me a book describing coils of all kinds and including a description of induction coils, impedance coils, repeating coils, and the Pupin inductance coil? I want a book which will give me details of construction, specifying resistance, number of turns, length, size of wire, shape of cores, and other dimensions; also the uses of such coils and their operation.—O. D., Kansas.

There is no book published which will give you complete information upon this subject. A number of articles have appeared in the technical journals describing in a general way the construction and uses of coils, but you cannot

obtain one book that will give you all the information called for. Your query covers a great deal of ground, and in order to secure only a part of the information you want, it will be necessary to purchase a half dozen books of different kinds.

We recommend that you watch TELEPHONY'S index to current literature, where you will find reference to many articles, and it is possible that some of these articles might be of use to you.

INFORMATION WANTED UPON MULTIPLE CABLE DISTRIBUTION.

We are contemplating putting in several leads of new cables in the early summer and would like to know more about the installation of the multiple system of all cable distribution, especially the multiple feature. I understand the principles of this, but do not understand the arrangement of the multiples for each box. Can you refer me to some publication where this system is treated in detail?—C. R. S., Indiana.

If you will write to our manufacturing advertisers, who offer cable distributing boxes, you will undoubtedly be able to secure the exact information you require, in connection with the dimensions and general arrangement of the boxes.

An interesting article upon new ideas of multiple cable distribution will be found on page forty-two of July, 1907, issue of TELEPHONY. Miller's book, "American Telephone Practice," also touches upon multiple cable distribution, and Abbott's book on "Telephony" will give you a general idea as to the different requirements when installing an all-cable system.

We would suggest that you watch TELEPHONY'S "Review of Telephone Literature," and you will undoubtedly find articles bearing upon the subject you desire to study.

CHARGING STORAGE BATTERIES.

Will you kindly advise me through the question and answer page of TELEPHONY the relative merits of the following three means of charging storage batteries for small common battery exchanges: direct from 110 or 220 volt D C lighting mains, using rheostat or lamp bank, small motor generator set, or a mercury arc rectifier? What I would like to obtain is comparative figures on the efficiency of all three schemes, figuring outside current at ten cents or thereabouts a kilowatt-hour. I would also appreciate your opinion as to whether it is practicable and safe to install only one set of storage cells when charging direct from D C lighting mains. Will there be any great risk of life with this arrangement, and also if such a circuit is installed what instruments, circuit breakers, switches, fuses, etc., would be advisable to install and under what circumstances or conditions could any of the above be omitted in case a cheap installation was absolutely necessary?—E. D. H., Illinois.

In order to answer your inquiry in an absolutely correct manner, it will be necessary to know more of the conditions than you gave us. Briefly, however, if you charge twelve cells of storage battery of a certain size from a 110-volt lighting circuit, it would be at an efficiency of somewhere between twenty-one and twenty-two per cent. A motor generator outfit may as a rule be considered to charge the batteries at an efficiency of sixty-five per cent. The mercury arc rectifier appears to be the most efficient arrangement, recent reports upon the subject indicating an efficiency of about seventy-six per cent when operated from 110-volt A. C. circuit. As stated above, however, it should be thoroughly understood that these figures of efficiencies are not necessarily absolutely correct owing to the differences which are bound to exist through different types of apparatus and different conditions under which work is being done, size of batteries, etc. Regarding the practice of installing only one set of storage batteries, it may be suggested that after closely observing something over fifty telephone exchanges equipped with a single set of storage batteries within a period of about six years, not a single instance has occurred which demonstrated that a duplicate set would have been more satisfactory. It may be safely concluded, therefore, that a duplicate set of batteries may be installed in a telephone exchange but we always consider it as a sort of needless luxury. There is no question but that it is an expensive plan.

Regarding circuit breakers, switches, fuses, etc., all charging circuits should be equipped with a circuit breaker of some kind, which will open the charging circuit when the current ceases to flow. Overload attachments are scarcely ever of any use. Fuses will generally take care of all flows of an abnormal current from the charging machine to the storage battery. As to the most economical arrangement of fuses, it may be suggested that only the negative side of the battery need be fused, provided the positive side is grounded. As respects switches, it is absolutely necessary to provide switches for the charging circuits and the discharge circuits and no particular saving can be effected in this portion of the equipment.

HOW TO POLISH TRANSMITTER CARBONS.

I am desirous of learning of some method which may be employed for polishing the carbon which is generally used in telephone transmitters, and would be pleased to have you give me information upon this subject.—L. T. C., Indiana.

There are generally two kinds of telephone transmitter carbons, one a soft grade and the other a much harder grade. The polishing operations, however, are in a general way similar. It should be understood that in polishing carbon it is first necessary to secure a very flat surface upon the carbon; then gradually reduce the size of the grains of the polishing compound, finishing up with either a carbon powder or using a very fine polishing compound such as is used by nickel platers in buffing articles requiring a very high polish. In polishing transmitter carbons, it is best to hold the article in such a manner that it will be rotated continuously while being polished. It is usual to fasten the carbon so it may rotate around its own center and also at the same time carried around the fixed center of the polishing machine. The carbon will then describe a spiral motion and it is this constant change of position between the carbon and the surface upon which the polishing compound has been placed which produces the high finish. Some transmitter makers use a carbon plate for the polishing surface and others an iron plate. Slate plates have also been used with considerable success.

HOW TO POLISH HARD RUBBER.

I would like to have information as to how hard rubber may be given the high polish which is found upon the fronts of spring jacks and the handles of switchboard keys.—B. B., Indiana.

Hard rubber may be polished in a number of different ways. One of the most common methods followed in polishing flat pieces of hard rubber consists in fastening a piece of coarse emery cloth to a flat surface and moving the piece of rubber back and forth over the coarse emery cloth in order to give the surface a comparatively smooth finish. Next substitute a finer grade of emery cloth. This you will find polishes the rubber by providing a finer cutting grain. After taking off the rough grain of the coarse emery, place a little oil upon the finer grade of emery cloth and continue the rubbing operation. If a still higher polish is wanted, secure a piece of felt. Fasten this to a flat surface, and upon removing the rubber from the oil saturated fine emery cloth, continue the polishing operation after transferring the piece of rubber to the felt pad. As a rule, this produces a very high polish, and is satisfactory for all practical purposes.

Round handles of ringing keys are polished in the same manner; that is, use a coarse emery cloth and gradually use a finer cloth and finish up with an oil saturated fine emery cloth.

It is convenient, of course, to hold the article in a lathe so that it may be rotated while applying the polish.

Wenonah, N. J., has a novel burglar alarm service. A burglar being discovered, the telephone office is notified and the operator flashed a red light visible from all parts of town to notify the night watchman.

WIRELESS TELEPHONY

Various Systems are Described in an Article Contributed to the National Telephone Journal

By J. Poole

WIRELESS telephony is now exciting much interest, and has lately made a great stride forward owing to the fact that means have been discovered for satisfactory transmission in a manner similar to that adopted in wireless telegraphy—viz.: by the aid of electric waves projected to a distance through the air.

Previous to this wireless telephony had been carried on to a very limited extent by two methods, which employed respectively (a) reflected light or heat rays and (b) leakage rays or currents. In the first (a) light or heat rays are projected from one reflector and received by another, such as in the case of Bell's photophone, Tainter's radiophone and Ruhmer's wireless telephone. In

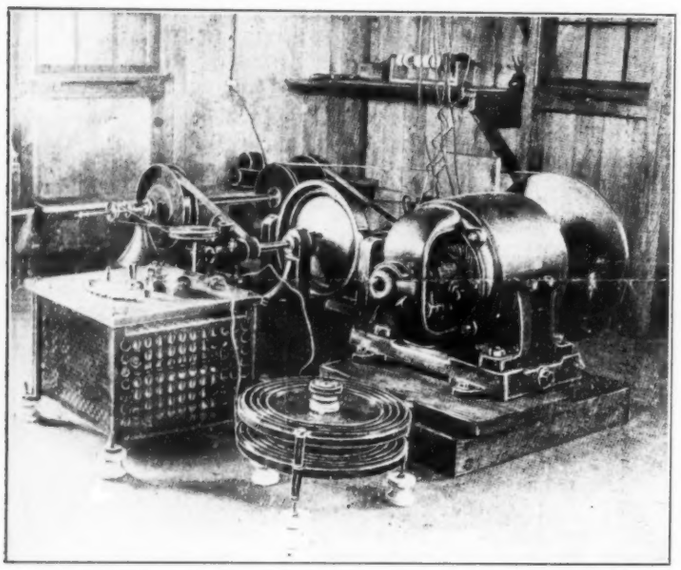


Figure 1—Fessenden alternator for wireless telephony.

Ruhmer's arrangement the light rays of an arc lamp are caused to vary in intensity by forming part of a microphone circuit, and are then reflected by means of a parabolic reflector on to a similar reflector at a distance, in the focus of which is a prepared selenium cell, this being included in the circuit of an ordinary telephone receiver.

In the second system (b) of carrying out wireless telephony leakage of current or of lines of force is utilized between two telephone circuits, each formed by a telephone instrument connected by a long or short line to two separate earth connections set as wide apart as possible. The leakage may take place through the earth, or the lines of force from the aerial lines may spread through the air to parallel circuits some distance away, such as across a river, but unless the lines are long compared to the distance separating them but little practical result can be obtained. Examples of the (b) system are the Orling-Armstrong and the Preece and Gavey wireless telephone arrangements.

Telephoning by means of the (a) methods is restricted by the conditions that the two stations must be visible one from the other, and that to obtain practical results over lines of a few miles in length it is necessary to employ powerful and expensive apparatus at the stations. With the (b) method the force which can be utilized diminishes as the fourth power of the distance separating the two circuits, so that it is evident that little use can be made of it for long distances. As a consequence of these difficulties neither of these methods can be said to point towards commercial results.

Telephonic transmission of a kind has also been accomplished by the aid of electro-magnetic waves sent through the air produced by sparking discharges, as used in the earlier and present systems of electro-magnetic wave telegraphy. These discharges were obtained usually from condensers, and consisted of groups of very rapid alternations of currents having a frequency of hundreds of thousands per second, separated by comparatively long intervals of some one-two thousandth or one-three thousandth part of a second. The discharges in any one group rapidly diminish in intensity, and hence give rise to what are called "damped waves."

Such sparking systems of wireless telephony suffered from the defect that the interruptions between successive groups of sparks were made at such rapidities that they caused sounds to be produced in the receiving instrument well within the audible range of the human ear. (According to Helmholtz the limit of this audibility may be taken at about 33,000 vibrations per second.) The rate of such sparking was also not uniform, so that the sounds when transmitted were accompanied by other harsh sounds at the receiving end, which interfered greatly with the transmission results.

What was required in order to eradicate these interferences, which prevented the practical success of such a system as the above, was some method of producing a practically continuous and uniform generation of electro-magnetic waves, the single waves following each other at such a rapidity that if a sound were generated it would be well beyond the range of audibility, or above 33,000 alternations per second.

Methods for the generation of such continuous high frequency waves were first discovered by Professor Elihu

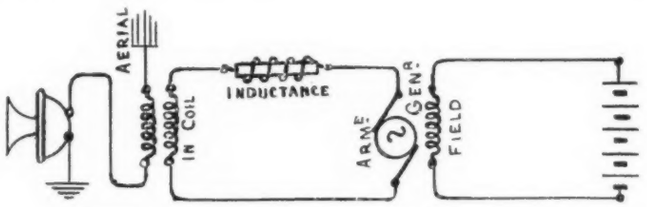


Figure 2—Transmitting station wireless telephony.

Thomson, in America, as far back as 1892, but such waves were not utilized for telephonic purposes until 1901, when Professor R. A. Fessenden of Washington, made improvements in the method of production and attained some success. He, however, obtained much more success with a dynamo which he devised, capble of normally giving 60,000 alternations per second, and which might be run as high as 80,000 cycles per second if required.

By the aid of this high speed alternator Professor Fessenden has worked out wireless telephony to a practical success; it is now in reliable operation over a distance of ten miles, and stations are being constructed to operate between two American cities thirty miles apart.

Professor Fessenden has given a history and details of his work in connection with wireless telephony in articles which appeared in the Electrical Review (London) of February 15 and 22 and March 1 of this year, to which description I am indebted for most of the particulars given in this article.

The alternator, which embodies many ingenious mechanical arrangements, is illustrated in Figure 1 (for which and for other figures I am indebted to the proprietors of the Electrical Review). The armature (having a resistance of about 6 ohms) is driven by belt gearing up to a speed of 10,000 revolutions per minute, and the voltage at this speed of 60,000 cycles per second is 60 volts. The operation of the machine is said to be extremely satisfactory, even though running at this high speed for six or seven hours per day. A steam turbine has since been built to drive the alternator, and 80,000 cycles per second are now easily obtained.

In operation the alternator is generally connected to the "aerial" high vertical conductor (which, in some cases, is over 400 feet high) through a transformer, as shown in Figure 2, which shows the connections adopted in one of the latest forms of transmitting arrangement. In the generator circuit is inserted an inductance and the primary of

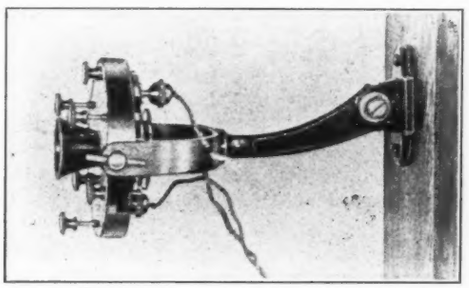


Figure 3—Wireless telephony transmitter.

an adjustable variable transformer, which latter has inductive cores. For telephoning over a line of ten miles, in one instance the primary turns of the transformer were ten, and current through them 2½ amperes, voltage 45; secondary coil, number of turns 700, voltage about 3,000, frequency 50,000. The number of turns of the transformer are altered to suit various conditions. The aerial is connected to the secondary of the transformer and the other end of the latter to a carbon transmitter and thence to earth.

The transmitter, shown in Figure 3, is a granular solid-back type of about eight ohms resistance, so constructed that it can carry a very heavy current, the heat generated by such current being dissipated by making the metal carbon chamber with two deep grooves, as shown at the back of the figure. In operation the aerial is tuned so as to be resonant to the period of the alternator, and acts with regard to the etheric waves in a somewhat analagous manner to that in which a bar of steel fixed at one end and struck at the other gives rise to sound waves in the air, or is even more analagous to the air vibrations in a closed organ pipe. If the vibrations are sufficiently rapid in such a pipe, musical sound waves are sent through the air, the effect being much enhanced if a resonant box or tube is used in connection with the vibrating body; so in the case of the aerial conductor, if the electrical vibrations or alternations are sufficiently rapid, electro-magnetic waves are sent through space from the aerial at the speed of light, or 186,000 miles per second.

By speaking into the transmitter while the alternator is in operation, the resistance is caused to vary, the voltage of the surging impulses in the aerial is by this varied in accordance with the sound waves and the etheric waves thrown off are correspondingly influenced.

The transmitter may be connected in the exciter circuit of the alternator, so that it will vary the strength of the exciting magnets and so give rise to variations of potential in the generated alternations, and to similar variations in the aerial surgings.

In another arrangement the transmitter is connected directly in series between the aerial and the generator, the other pole of the latter being earthed, all the parts being thus in one series circuit.

A type of transmitter which has given excellent results

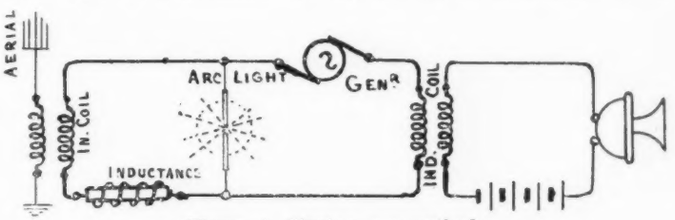


Figure 4—Singing arc method.

is the "condenser" transmitter, which is the old form of Dolbear's telephone, in which the approach and recession of a conducting diaphragm to and from a fixed conducting plate varies the capacity, and so affects the potential difference of a conductor in connection with one of the plates and a source of electro-motive force, and thus may be made to affect the resonance of the aerial. It is stated that in one experiment with this transmitter, having a diaphragm two centimetres in diameter (? 2 inches), an inward movement of the diaphragm of only 1/100th of an inch reduced the current from 3.1 to 2.5 amperes.

The discovery of the singing electric arc by Duddell (which was on similar lines to a discovery of Professor E. Thomson already referred to, and was utilized by Ruhmer for his wireless telephony), followed by the great improvement made by Poulsen, by causing the arc to be formed in hydrocarbon gases under high pressure, and with the temperature of one of the poles kept low by circulating water, has opened up a promising field for electro-magnetic wave transmission for telephonic purposes. By such means, steady alternations in a shunt circuit about the two poles of an arc (such shunt containing capacity and inductance between certain calculated limits) can be obtained of very high frequency, even a million per second, and the electro-magnetic waves arising from such alternations would appear to offer a very satisfactory line or conductor, as it were, on which the speech wave undulations may be superposed.

Experiments have already been made on this principle

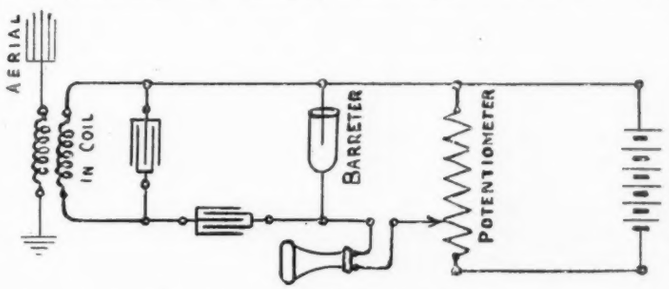


Figure 5—Barretter receiving circuit.

by Professor Ruhmer between Berlin and Nauen, a distance of some sixteen miles. At the transmitting station some twelve arcs in series were used, each having a carbon and copper pole. The arcs were operated by current of 4 amperes at a voltage of 440. The frequency of the oscillations was 400,000 per second.

Figure 4 shows the connections at the sending end, one arc only being shown. The comparatively small variations in the carbon microphone cause very great fluctuations in the arcs and in the shunt circuit, which, through the me-

dium of the translator, correspondingly influences the surgings in the aerial and the transmitted electro-magnetic waves. Experiments with wireless telephony on the Poulsen system are now being carried on between Oxford and Cambridge.

The Receiver.—In order to utilize the transmitted etherial waves for telephonic purposes, they are gathered up or intercepted by another "aerial" at the distant station, and various types of receivers are used in connection with this aerial for converting such received ethereal waves into conducted electrical waves or currents, and then into corresponding sound waves.

The receiver which has been most generally used by Professor Fessenden is known as the "liquid barretter." This instrument is a small cylinder containing a conducting liquid, such as acidulated water, immersed in which is a metal diaphragm having a very small hole in the centre, opposite which hole is fixed a very finely pointed platinum wire connected to the collecting aerial. The received waves act upon the layer of liquid lying between the fine point and the rim of the small hole in the diaphragm, causing the resistance to vary in proportion to the intensity of the waves. The barretter is shunted by a circuit containing a battery and an ordinary telephone receiver as shown in Figure 5. The variations in resistance produced by the varying strengths of the electro-magnetic waves cause a reproduction of the original sound waves in the telephone.

Fessenden's thermal barretter has also been used as a receiver with good results. This is made up like a small

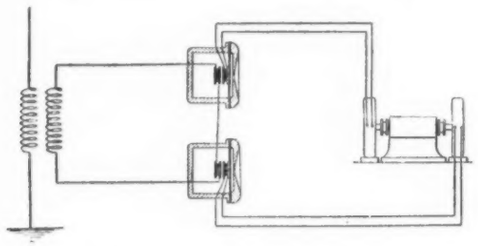


Figure 6—Heterodyne receiver.

carbon filament electric lamp, but in place of carbon a very short length of platinum wire, drawn down to a diameter of only .06 of a mil is used. The electric oscillations from the receiving aerial are sent through several of these barretters, which are connected in parallel with a telephone receiver and a source of small electro-motive force. Variations of resistance caused by the heating of the fine wire by the received oscillations cause the reproduction of the sounds in the telephone.

Such receivers of electric waves as those just described are "current operated" receivers and act continuously, as contrasted with "voltage operated" receivers, such as the carbon or metal filing "coherers" used in wireless telegraphy, which act intermittently by the circuit being first rendered conducting by the impinging of electric waves and then being rendered non-conducting by some mechanical or electrical process. Receivers of the latter class are unsuitable for wireless telephony and only those of the first-class can be used for the purpose.

All forms of the voltage operated receivers and nearly all of the current operated receivers are very inefficient. Even the liquid barretter, which is considered by Professor Fessenden to be as sensitive as any in common use, has an efficiency of only about 0.1 per cent for weak signals. Such a barretter will give an audible indication with a current energy of between .01 and .001 of an erg, while an ordinary telephone receiver will respond to less than .000001 of an erg (an erg is one ten-millionth of the work done in a second by a current of 1 ampere passing through a resistance of 1 ohm). It is evident, therefore, that if any method could be devised for using a telephone receiver to be acted on directly by the received waves, the efficiency would be increased about 1,000 times. This has been done by Professor Fessenden by means of his "heterodyne" receiver, which he describes as follows:

"A telephone is constructed having a fixed magnetic core formed of iron wires 1/1000th of an inch thick and excited from a source of high frequency, such as a high frequency or condenser dynamo. A small coil, with or without a core, is cemented to a thin mica diaphragm, and this coil is arranged to be excited by the oscillations produced by the received magnetic waves." Two heterodyne receivers of a modified form are shown in Figure 6 connected to a translator and to a double high frequency generator.

An advantage of the heterodyne receiver is that it is unaffected by atmospheric disturbances or disturbances from near-by wireless stations and that it lends itself to multiplex working. There is no difficulty in receiving a message on the same aerial which is being used to transmit a message to another station, and practically any number of messages can be simultaneously transmitted and received on the same aerial without interference.

The following notes of general interest are, by the courtesy of the proprietors of the Electrical Review, abstracted from Professor Fessenden's articles in that journal already referred to above:

The clearness of the speech received varies with the type of wireless telephone apparatus used. Where a spark is used at the transmitting end there is always more or less of a hissing or crackling noise in the receiver, which, though extremely disagreeable, is not enough to interfere with the transmission so long as the spark is properly adjusted. Where no spark is used for transmitting, and a carbon transmitter is used for modifying the strength of the waves, the speech is as distinct as over a short telephone line, and much more distinct than over lines containing cables, and there is a total absence of extraneous noise. When a condenser transmitter is used at the sending end the speech is much more distinct than over any wire telephone line, and, where a double telephone is used as receiver, produces a pecular illusion, as if the speaker were talking in the same room as the hearer, and the room were covered with sound absorbing hangings, cutting off all reverberation or echo.

The Future Prospects of Wireless Telephony.—Telephony by wireless methods has a great advantage over the present methods, in that there appears to be no distortion of the transmission with increase of distance. This might, indeed, have been anticipated. It has, however, been experimentally demonstrated, by comparison of the relative intensities of notes of different frequencies at different distances.

There would appear, therefore, to be no reason why wireless telephony should not be operative over much longer distances than is possible in the case of wire lines. It is true that telephone relays are now in commercial use on a number of long lines; for instance, in talking from Boston to Cleveland it is customary to relay at New York or Troy, but these telephones relays do not improve the articulation, and merely increase the loudness of the speech, leaving the distortion unchanged, and, in fact, making it slightly worse than it is without the relay.

The difficult problem in wireless telephony is, of course, the modulation of the large amount of energy used for transmission. Where a carbon transmitter is used for this purpose an ordinary transmitter will not successfully modulate more than half an ampere of current, and even with special transmitter buttons 2½ amperes seems to be about the limit. With multiple buttons the limit is reached at about 10 amperes.

For currents larger than 10 amperes a number of telephone relays placed in series and operated by a single trans-

mitter can be used. The limit to this arrangement is not yet known.

Where the telephone transmitter is used to affect the strength of the field of a high frequency dynamo, the amount of power which can be handled is less than 10 kilowatts, on account of the fact that the self-induction of the armature increases very rapidly with the output. Where the transmitter is used to divert the magnetic flux, no limit has as yet been reached. The same statement applies to the case where a condenser telephone is used for affecting the resonance.

Up to the present, therefore, it is not possible to state what the limiting distance of transmission by wireless telephony is. It appears fairly certain, however, that there will be no difficulty in communicating between ships at least 200 miles apart, provided that they have masts at least 130 feet high, and are equipped with aerials of suitable capacity.

One advantage which the wireless telephone has over the wireless telegraph is that it does not require a skilled telegraph operator to operate it, and, moreover, it is not put out of work by atmospheric or other disturbances, since the speech is readily understood over the noise. The extent to which this is the case is shown by the fact that, as a rule, individuals who have listened to the wireless telephone for the first time, and are asked after they have removed the receiver from their ears if there was any atmospheric disturbances or interference, have almost invariably to replace the receiver to their ears before being able to answer the question.

This is, of course, only another instance of the well known selective power of the human ear, which enables it to interpret speech over a wire telephone through disturbances many times the intensity of the transmitted speech.

It is doubtful whether wireless telephony will ever supplant the present wire local exchanges. The difficulty is not entirely one of selectivity, as though this is a sufficiently serious one it is not impossible, improbable as it may seem, to overcome it. The difficulty goes down to the basic fact that the most successful local system will be the one which is the simplest and least liable to get out of order. Now nothing, so far as the subscriber is concerned, can be more simple than the present central energy system, and it is not likely, therefore, that there will be any immediate future for wireless telephony in this field.

As regards long-distance telephony, however, the matter is a different one. Speech has already been actually transmitted to a wireless sending station, automatically relayed from the wireless sending station to a wireless receiving station, and automatically relayed again from the wireless receiving station out over a wire telephone line and heard with perfect distinctness.

In addition, messages of more than one frequency have been simultaneously transmitted, and a test will shortly be made, the success of which is not doubtful, on sending out speech from a wireless antenna, while at the same time receiving speech from another station on the same antenna.

The cost of a long-distance wire telephone line is considerable. The line must be of high conductivity and of the very highest class of construction. It is understood that some of the long-distance telephone lines in America have cost not less than $750 per mile. For a distance of 1,000 miles this means an expenditure of $750,000.

While at the present time long-distance wireless telephony may seem rather premature, those who are acquainted with the actual operation of the apparatus know that there is no difficulty in the way, provided sufficient power and capacity be used to overcome the effects of atmospheric absorption. In addition, the fact that multiplex telephony can be obtained between two wireless stations should be a great commercial advantage.

It is, therefore, not at all improbable that, in addition to its use on shipboard, wireless telephony will have a real commercial field in long-distance telephony.

Another disadvantage which wire telephone lines labor under is the effect of capacity. Relays cannot overcome this difficulty, and the use of the Heaviside-Pupin method has not, as yet, shown itself practicable for the transmission of speech by cable across the sea. Moreover, even if this were possible, the cost of a deep sea cable is even higher than that of the best-constructed landline, approximating $1,000 per mile. As the wireless telephone is not subject to these capacity effects, it is, in the writer's opinion, only a matter of time when wireless telephony will come into use for long-distance telephony across water.

TELEPHONY IN THE FAR NORTHEAST.

WE HAVE long insisted that telephone wires are distributed pretty generally around the world; but here is proof that they reach even into the corners. In the city of St. John's, Newfoundland, which is on the extreme northeastern point of North America, one thousand miles nearer to the Old World than New York is, the great groceries and manufactories could not get along without the telephone; and the well-to-do householder telephones in his order with as great convenience and dispatch as we enjoy who are located in the very center of telephone ubiquity. The rate in St. John's is forty dollars a year, but the city's telephone subscribers seem to have reached a degree of prosperity where they are willing to pay the price.

Telephone line on St. John's principal street.

A BIT OF TELEPHONE ETIQUETTE.

HERE is a timely reference to a part of the code of telephone etiquette in a recent issue of the Schenectady (New York) Gazette:

"Telephones are used to such an extent that there are some rules in regard to them that should not be overlooked —rules that involve the time and patience of the one at the other end of the line. There are some people who fall into the habit of calling for a certain number, and, after they have given it, of turning around and commencing to chat with others in the room. Meanwhile, the person called up is vainly shouting 'Hello' and making up his mind that it was only a mistake of the operator. After he has almost shouted his lungs out in order to find what is wanted of him, the careless party finishes his gossip and turns to the telephone. He need not be surprised at a sharp answer. He had absolutely no excuse for his thoughtlessness. He, and the one who asks a question to be answered as a matter of courtesy only, and then forgets to say, 'Thank you,' ought never to have the use of a telephone."

Digest of Telephone Patents

By Edward E. Clement

881,985. Plug Seat Switch. Wells. The cord plug operates a plunger which has insulating and conducting portions. Contact springs are adapted to engage the insulating and conducting portions and when the plug is removed from its seat the normal connections are reversed. Application filed Dec. 8, 1904. Patent assigned to Sterling Electric Company.

882,026. Means for Transmitting Electric Currents with Increased Energy. Stratton. This is a repeater in which the energy is increased by the reduction of the effects of inductive impedance to a minimum. Application filed July 13, 1906. Patent unassigned.

882,118. Annunciator. Needham. The insertion of a plug from either side of the board restores the indicator to its normal position by a novel arrangement of the spring jack switch connections. Application filed May 27, 1907. Patent assigned one-half to Postal Telegraph Cable Company.

882,347. Composite Signaling and Telephone System. Rugh. The same line conductors may act to convey both telephonic and telegraphic currents by the proper arrangement of impedance coils and non-induction resistances. Application filed June 14, 1906. Patent unassigned.

882,684. Sound Muffler. Hirsh. This is a muffler having a spring clamp and adapted to be placed over one ear of the person while a telephone receiver is being held to the other ear. Application filed Aug. 5, 1907. Patent unassigned.

882,850. Lineman's Portable Telegraph and Telephone Pole Seat. Troell. The seat is carried by a frame having clamping members arranged to be adjustably secured to a pole. Application filed May 11, 1906. Patent unassigned.

833,003. Audiphone. Davy. The device comprises a pair of receivers with sound concentrating tubes adapted for insertion into the ears and being connected with a transmitter that can be carried in the pocket of the user. Application filed May 3, 1907. Patent assigned to George G. Schroeder.

883,088. Telephone Instrument. Cole. The receiver and transmitter are both provided with slides which are arranged to restrict the entrance passages thereto; that in the transmitter being designed to permit conversation with a third person which cannot be heard over the line; and the receiver slide cutting off disagreeable and loud noises coming over the line. Application filed Jan. 10, 1906. Patent assigned one-half to Sarah A. White, Birmingham, Alabama.

883,093. Divided Central Telephone System. Dean. The signals upon the various divisions of a divided central switchboard may be selectively operated by currents of different strengths controlled from the substation. Application filed June 15, 1903. Patent assigned to Kellogg Switchboard & Supply Company.

883,723. Electric Transmission of Intelligence. Kitsee. The object of this invention is to neutralize impulses induced in lines of transmission from neighboring wires. Application filed July 12, 1907. Patent unassigned.

883,724. Electric Transmission of Intelligence. Kitsee. This, as in the preceding patent, has for its object the neutralization of the impulses induced from neighboring lines. Application filed July 18, 1907. Patent unassigned.

833,811. Telephone Support. Kraus. This device comprises a housing, containing a spherical bearing member which engages a spring member and is moved only in opposition to the friction against said spring. Application filed Sept. 1, 1906. Patent unassigned.

884,235. Receiver for Telephones. Steinberger. The receiver has a self-locking cap which cannot ordinarily be moved without taking the receiver apart. Application filed Feb. 18, 1907. Patent unassigned.

884,500. Telephone Desk Stand. Knudsen. This comprises a hollow base with a casing of thin metal and a horizontal plate secured within the base and carrying the switch springs. Application filed Sept. 2, 1904. Patent assigned to Kellogg Switchboard & Supply Company.

884,607. Telephone Fire Alarm System. McLewee. This comprises a telephone circuit and signaling mechanism arranged to be operated over said circuit. Application filed April 9, 1906. Patent unassigned.

884,637. Telephone Attachment. Bythiner. A wire rack is arranged to hold an indicating plate and a lead pencil and has a circular member adapted to encircle the transmitter of a telephone. Application filed September 5, 1907. Patent unassigned.

869,554. Automatic Testing and Resetting Means for Electro-Thermal Protectors. Cook. This is a testing device for a heat cartridge, operable in a given direction, comprising means for applying current to the cartridge to heat the same and for operating the cartridge still further in the same direction when thus heated, as a test on the latter. Application filed May 19, 1906. Patent unassigned.

869,864. Automatic Resetting and Testing Means for Thermal Protectors. Cook. A resetting tool for a reversible electro-thermal protector having a central operable member, comprising means for applying current to the protector to heat the same and spring mechanism for operating the central operable member in one direction to reset same for another operation in a reverse direction. Application filed April 28, 1906. Patent unassigned.

870,495. Automatic Resoldering Device for Electrical Protective Apparatus. Cook. This is a repairing device for thermal protectors comprising two pairs of normally separated spring members, means for normally holding the pairs of spring members in this separated relation and a thumb piece adapted to be depressed whereby the contact between each pair of spring members is closed. Application filed March 8, 1906. Patent unassigned.

871,984. Cable Terminal and Junction Box. Cook. This cable terminal comprises an enclosed box of sheet metal, a removable cover for the front of the box, fanning strips secured to the rear of the box, and protective devices mounted on the box and the fanning strips. Application filed July 9, 1906. Patent unassigned.

878,012. Automatic Electric Supervisory and Signaling

System. Nolen. A plurality of heat responsive devices when operated cause a signal transmitting device to operate a line signal on a telephone switchboard. Application filed Dec. 23, 1902. Patent assigned one-half to Frank B. Cook.

878,816. Sleeve for Joining Wire Ends. Maxstadt. The device consists of a piece of sheet metal having its side edges bent toward each other and turned inwardly, the edges being brazed together. Application filed Nov. 7, 1904. Patent assigned by mesne assignments to Frank B. Cook.

879,035. Cable Terminal. Cook. The terminal comprises a distributing plate, channel portions secured to the plate, sheet metal rings and protective apparatus mounted around the sheet metal rings. Application filed May 28, 1906. Patent unassigned.

879,087. Wire Rope Clamp. Cook. The clamp has a recessed base portion adapted to receive a pair of strands which are held in position by means of a U-bolt, the legs of which extend through the base portion. Application filed Jan. 30, 1905. Patent unassigned.

883,625. Cable Terminal. Cook. In this terminal protector mounting sections are mounted vertically on the base, each section comprising two curved portions and flanged portions at the ends of the curved portions. Application filed July 12, 1907. Patent unassigned.

883,626. Electrical Line Protector. Cook. This is a fuse which is adapted to be suspended from a line wire and a lightning arrester and means for connecting the fuse and lightning arrester as protectors for the circuit. Application filed Sept. 6, 1907. Patent unassigned.

MR. FOWLE OPENS CHICAGO OFFICE.

FRANK F. FOWLE, who has opened an office as a consulting electrical and telephone engineer in the Marquette building, Chicago, was, until February 1st of this year, with the American Telephone & Telegraph Company. Mr. Fowle was born in San Francisco, California, in 1877. His education was received in Boston, Massachusetts, where he went through the grammar schools and attended the Mechanic Arts High School for two years, and when leaving there, entered the Massachusetts Institute of Technology. He graduated from the latter institution with the class of 1899, and entered the engineering department of the American Telephone & Telegraph Company at New York. For the next four years he performed a wide variety of engineering work, which included the designing and testing of power plants in telephone central offices, and several investigations of interferences between telephone systems and high tension power lines and problems of transportation. He was also engaged in laboratory experimental work and numerous tests of transmission efficiency in connection with the experimental development of the Pupin system of loading. He also had some experience in the operation of electric light plants, having had charge of an isolated light plant during his college vacation in the summer of 1898. In 1903, Mr. Fowle left the engineering department, becoming associated with the railway department at New York and acted in the capacity of technical adviser on questions relating to the operation of private telephone systems for railway service, including general communication and telephone train dispatching. Mr. Fowle prepared preliminary plans and estimates for the telephone system which was installed by the Long Island Railroad, in connection with the general electrification and plans for the load dispatchers' telephone system which is now in operation in the electric zone on the New York & Hudson River Railroad. He also devoted considerable time to the introduction of the railway composite among the steam roads. In February, 1906, Mr. Fowle left the railway department to become manager in the operating department, Chicago, Illinois, taking charge of the long-distance service in Chicago and the surrounding territory, which embraced part of the states of Illinois, Wisconsin, Michigan and Indiana. The operation and maintenance of the long-distance plant in this territory were in his charge, and the plant embraced about 2,000 miles of pole line and 40,000 miles of wire, and several of the smaller offices in the territory.

Mr. Fowle has opened his office of consulting engineer for the practice in the field of electrical engineer, and will make a specialty of telephone work and problems allied thereto. He will also enter the railroad telephone field, which his experience peculiarly fits him for. He has published several technical articles, and is the author of a paper on transposition of electrical conductors, which was read before the American Institute of Electrical Engineers in October, 1904.

He has also read several papers before the Association of Railway Telegraph Superintendents. He is an associate

Frank F. Fowle.

member of the American Institute of Electrical Engineers, Railway Signal Association and the Association of Railway Telegraph Superintendents.

NEBRASKA TELEPHONE WORK.

THE New State Telephone Company of Sioux City, Iowa, has poles on the ground between Hoskins and Wayne, Nebraska, and as soon as this gap is closed Norfolk will have good, first-class standard construction to Sioux City, which will give long-distance connection as far north as Minneapolis and St. Paul. There is also in course of construction at the present time a line from Norfolk to Madison and with the continuing of this line to Creston it will close the gap between Norfolk and Columbus, which will then furnish service from Norfolk to Lincoln, Omaha, South Omaha, Council Bluffs and the South Platte territory. There is at present a line from Norfolk west along the Northwestern to Battle Creek, which will be extended further west in the near future.

THE MINE TELEPHONE

Some of the Many Advantages of this Comparatively New Apparatus.

By H. C. Slemin.

THE telephone system in the mine is of even greater necessity than a sprinkler system throughout a ten-acre manufacturing establishment. Such general use is found for the telephone in these days that we cease to be astonished by its marvelous possibilities and are even inclined to overlook some of its useful possibilities.

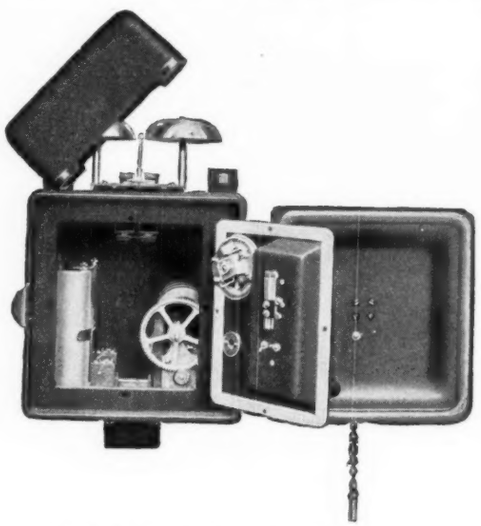
The use of telephones in mines is not of recent origin, but it is only within recent years that they have been used to any great extent. Their use formerly was confined to landings and deep shaft workings, but with the advent of the Independent telephone, which can be bought outright, their use became more extensive. The frequent occurrence of inevitable disasters in mines has caused mine operators to exert untiring efforts to devise some method of prevention and insurance against common mine accidents. When it is realized that every rift, siding or shaft in a mine can be instantly communicated with, it is readily apparent that no other service can be of such great advantage at all times as the telephone. Like many other recent discoveries and developments, the mine telephone's advantages are not really appreciated until they have been tried.

Whether the operations are large or comparatively small, a well-organized mine cannot afford to be without a telephone system. An important item in connection with having telephone service in the mines is the saving effected by being able to notify the men working in the different parts of the mines of an unexpected shut-down of some of the various machinery, or a change in the working plans for the requirements of the mine. Mine operators are frank to say that the cost of the system is soon made by the presence of this feature alone. It is a well-known fact, as is daily made plain to us by the newspapers, that the operation of most mines is dependent upon a variety of uncertain conditions, such as scarcity of cars, breakdowns of machinery, floods, etc., rendering it impossible to anticipate a temporary suspension of work in advance of its actual occurrence. The fact that a superintendent of a mine can remain in his office and be in direct communication with every corner of the entire system of shafts and rifts is an item of importance that we cannot pass without considering seriously.

The cost of constructing a line underground is usually less than outside, because no poles are required and there are no holes to dig. The magneto system does not require an expert to install it, and about all the work required of the mine owner is the placing of the instruments to the best advantage and the stringing of line wires. This is simply and quickly done by running wires through the rifts and down the shafts on standard wood brackets equipped with the regular common glass insulator. In a large number of mines, rope haulage is used to convey the ore to the surface and where such is the case a metallic signal line is usually run along the side of the entry to transmit signals to the engineer. If such a condition exists, it is only necessary to connect any number of bridging telephones to the circuit. In this case no expense is incurred beyond the first cost of the telephones and the cost of connecting them up. The expense of maintenance is usually very light, because the lines being underground are not subject to atmospheric conditions that are present outside and trouble from lightning is unknown.

Although ordinary iron line wire has been used with success in some mines, the safest construction can be furnished at little additional cost by supplementing rubber covered wire for all the underground circuits which are in any way subject to moisture or dampness from contact with timbers, etc. Some conditions are so uncertain that it has been considered good practice to use lead covered cable, providing the installation warrants the expense. In any event, this part of the equipment should not be slighted and the best is usually the cheapest and by installing cable an increased degree of certainty is of course assured.

Mine telephones are unlike any other telephone instruments and should be complete and compact and especially built for use in mines. The instrument illustrated on this page is designed to withstand the severest atmospheric and climatic conditions, and being of the ironclad type is suitable for outdoor and underground installations, where an intrument of this kind is most likely required to give service under such conditions. The design should be such as to afford the greatest accessibility of all parts and at the same time provide ample protection, eliminating the exposure of any parts when the instrument is not in use. The door on this type of telephone usually closes against a rubber gasket so as to hermetically seal the entire contents. The only part of the instrument that is necessary to handle by the casual user is the receiver, which should be of a thoroughly insulated and efficient type that may be depended upon at all times. The design illustrated shows the receiver hanging on the inner door, which is temporarily fastened by machine screws and only accessible to the inspection of the man in charge of the system.



Modern type of mine telephone.

Access to the inner compartment is only necessary for replacing batteries. A notable feature in this arrangement is incorporated in the design of the ringer, which is so arranged that its coils are enclosed inside the inner compartment, whereas its vibrating mechanism, consisting of the armature, clapper rod and gongs, mounts on top of the case

and is protected by an iron dome which is removable after taking out the mounting screws. It is necessary that careful attention is given to the construction of the compartment containing the essential parts of apparatus. In this type of telephone a felt ring gasket for the inner compartment door as well as a rubber gasket between the ringer mounting plate and the top of the iron case is provided. Impregnation by water or gases is absolutely impossible.

Individual parts of the mine telephone require special treatment as regards finish, so that they will withstand all climatic and atmospheric conditions. The iron case is treated with a special insulating compound that effectively preserves it from water, dampness and the acid fumes present in mines. All windings for the ringer, induction coil, generator, etc., are especially insulated and boiled in oil as an additional precaution and insulation. Wherever it is possible to substitute brass for iron in the construction of the mechanism, it has been done so as to eliminate a chance of having parts in the instrument that might rust. The parts that are necessarily of steel, because of forming a part of the magnetic circuit, are taken care of by the zinc plating. Every feature in this type of telephone requires the most careful construction as well as assembling.

The mine telephone illustrated herein measures over all ten inches wide by ten and three-quarter inches high by eight and one-quarter inches deep and is one of the smallest and the most compact instruments of its type for this particular service. The detachable mounting bars permit the instrument to be mounted without opening the door or the hook, and being detachable permits fastening the bars in a horizontal or vertical position, depending upon the nature of the surface on which the instrument is to be placed. A standard magneto equipment of the highest efficiency, especially finished, as hereinbefore mentioned, includes a five-bar generator and 1,600-ohm ringer, which is the standard for most installations. Equipments of the same character varying in capacity for the ringer and generator may be desired for varying conditions.

SAMUEL B. RAWSON DEAD.

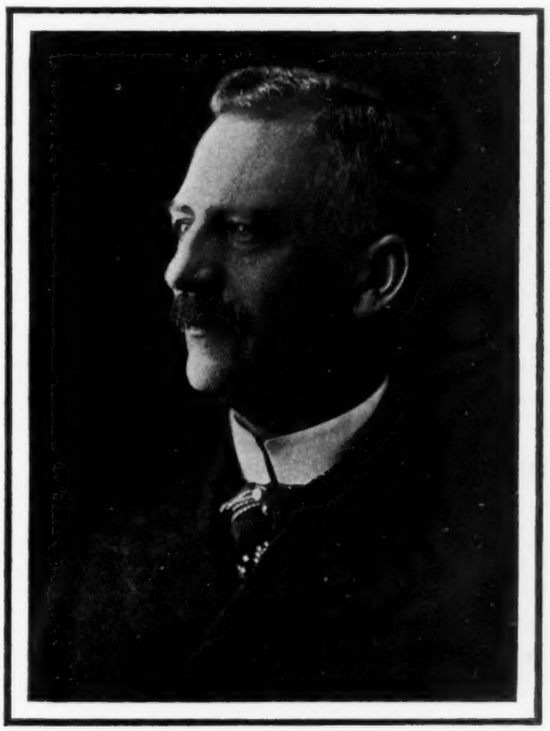
THE death of Samuel Bela Rawson, president of the Dean Electric Company of Elyria, Ohio, and one of the most prominent figures in the Independent telephone business, comes as a personal bereavement to every worker in the telephone field. Of a modest and retiring disposition, he was an infrequent attendant at conventions and business meetings, yet his influence made itself felt throughout the telephone world. His natural reticence made him the type of American business man whose accomplishments are deeds, not words.

He was one of those pioneers to whom the Independent cause owes its present magnitude and stability. In those early days of the Independent movement, when the heroic efforts of its few sponsors were viewed with suspicion if not with open derision, he nevertheless was enabled by virtue of his known integrity to secure the control of vast sums for the work of organization and construction which often seemed such a forlorn hope.

A business "fighter" in the most honorable sense of the word, in his fifteen years' struggle against monopolistic interests, his opponents were among the first to recognize his broad abilities and upright policy. In all the branches of the telephone industry which had benefited by his foresight and energy, the loss of his leadership will be keenly felt; and in his inspiring personality "Sam" Rawson will be hard to replace.

Besides his connection with the Dean Electric Company, Mr. Rawson was president of the Rawson Electric Company and the American Construction and Trading Company of Elyria, and the Independent Union Telephone Company of Albany, New York. He was a director in the Niagara County Home Telephone Company of Niagara Falls; the Interstate Telephone Company of Little Falls; the Albany Home Telephone Company of Albany; the Schenectady Home Telephone Company of Schenectady; the Seneca County Home Telephone Company of Seneca Falls; the Cohoes-Waterford Home Telephone Company of Cohoes; the Watervliet-Green Island Home Telephone Company of Watervliet; the West Shore Home Telephone Company of Catskill, and the Citizens' Standard Telephone Company of Kingston, all in the state of New York.

Samuel B. Rawson was born in Elyria, Ohio, fifty-nine years ago, and had spent his life there. He leaves a widow and one daughter. His funeral, on April 12, was attended



The late Samuel B. Rawson.

by prominent Independent telephone men from New York, Ohio, Michigan and Missouri.

The officers of the International Independent Telephone Association adopted the following memorial:

At his home in Elyria, Ohio, on April 9, 1908, Samuel B. Rawson died. He had been a pioneer in the field of Independent telephony since 1894, when he established the Rawson Electric Company, to manufacture telephones and apparatus. This company, after ten years of effort and success, was succeeded by one of the great manufacturing institutions of our country, the Dean Electric Company.

Mr. Rawson built up many telephone exchanges in Ohio and New York. He was affiliated with state and national associations of the Independent telephone companies. He was a man widely and favorably known, whose death in the prime of his manhood is sincerely mourned.

He was not only honest, but conscientious; he was not only temperate, but of clean morals; he was not only successful, but his work was good.

He was everywhere recognized as a faithful husband, a loving parent, a reliable partner, a genial companion, a true friend and a good citizen. Modest and retiring in disposition, he was a strong business associate, abounding in good work, beloved by many.

In behalf of the members of the International Independent Telephone Association these words of appreciation are spoken, because of the many admirable and sterling qualities of the departed friend and co-worker—Samuel Bela Rawson.

A. C. LINDEMUTH,
JOSEPH B. WARE,
B. G. HUBBELL.

April 15, 1908.

A Fight With an Octopus

By Paul Latzke

The Story of the Bell Company's Rise to a Power that was second only to that of the Standard Oil Company—The Betrayal of Friends and Associates, The Sacrifice of Great National Characters and the Desperate Purpose of a Fight that was Carried Straight into the White House.

A FOREWORD.

[This story should appeal especially to those who have good, red American blood in their veins. It is the story of a magnificent fight that was won against overwhelming odds. It is the story of a smug coterie of "Boston gentlemen" of the immaculate type, put to flight by a few sturdy men out of the west. It is the story of a low, scheming campaign of greed, that was turned into a rout by a fine, sentimental, American citizenship. It is a story full of dramatic interest, not because of the manner of telling, which is simple and commonplace enough, but because of the facts it relates.

It is the story of at least one trust that was "busted." It is a story that, while dealing with the details of an industrial war, will interest even the women, for it is full of good, clean, honest fighting, of the deeds of men who stood shoulder to shoulder under the Stars and Stripes, and, in the name of American freedom and independence, lined up against the most complete and relentless and successful monopoly of the times—and beat it to a pulp. It is a poor sort either of man or woman who cannot find somewhere in the record of these fighters the story of a deed that will stir the pulse.—THE AUTHOR.]

CHAPTER X.

THE TRUST SCHEME OF ORGANIZATION.

EVEN before the decision of the supreme court, in 1887, which gave the Bell company an ironclad monopoly, a perfect organization had been perfected by the controlling spirits in the company. It differed only slightly from the system now in control. The country was divided into districts, in each of which a licensee or local operating company was organized. These companies were required to turn over to the American Bell Telephone Company, in Boston, anywhere from fifty-one to sixty-five per cent of their stock, to find all the capital for building their plants, and to execute contracts under the terms of which they bound themselves to lease telephone transmitters and receivers from the parent company, at an annual rental averaging about fourteen dollars a year for the set. As these parts cost to make something less than four dollars, there was here, to start with, a magnificent profit of ten dollars a year on each set, a profit which, of course, the telephone user had to pay.

Furthermore, the local companies were required to bind themselves by contract to purchase their switchboards and most of their other supplies from the manufacturing department of the American Bell Telephone Company. This department was afterwards organized into what is now known as the Western Electric Company, with factories in New York and Chicago. There were some individual stockholders in this concern, and are, to-day, but the majority of the stock was owned by the American Bell Telephone Company. Here, then, was another source of great profit, as all the equipment manufactured was turned over to the operating companies, at a high figure, sometimes 100 per cent higher than the same equipment and supplies could be bought for in the open market. The burden of this profit was shifted on to the subscribers. Finally, when the "long-distance" scheme developed, a third source of profit was added to the machinery of the controlling concern in Boston. The local companies had no participation at all in the "long-distance" tolls, nor have they, to-day, as this money goes entirely into the coffers of the parent concern. There were a few among the licensee companies that were exempt from a number of these exactions, but they were not sufficiently general to make their consideration worth while.

During later years, there have been several changes in the plan of organization; but, on the whole, the original scheme has been adhered to. The American Telephone and Telegraph Company, which handled the long-distance business, has been substituted for the American Bell Telephone Company as the controlling company, the latter existing now merely as a holding concern for the various patents that have been granted from time to time. Of the local or sub-licensee companies, there are now forty, or, rather, thirty-nine, as the Empire State and the Central New York companies, operating in adjacent territory in central New York, have been consolidated.

It was a perfect organization such as this that the Independents had to face when they started in opposition, in 1894; a huge, smooth-moving machine of unlimited power, backed by hundreds of millions of capital. There were two weak spots in the machine, however. It had the active enmity of the American people, and its management was in charge of men who believed that the telephone business was theirs by right, and must always remain theirs. The tremendous weapon of monopoly, placed in their hands by the supreme court, had made them arrogant and intolerant. They had come to believe, and believe honestly, that anyone who attempted to enter the telephone field, no matter through what gate, was a lawbreaker—an infringer—an interloper.

John E. Hudson, who had, at this time, succeeded Bell's father-in-law as the dominating figure in the American Bell Telephone Company, was the embodiment of this spirit. He was a man of strong character, able as an executive, but thoroughly spoiled by the atmosphere of monopoly in which he had been bred. It was from him, after Hubbard, that the entire Bell organization took its cue. The public must pay what the monopoly demanded, or go without telephones. The existence of competition must not be recognized. It could not exist lawfully. This had been made clear to the minds of Mr. Hudson and his associates and subordinates by the brutally successful way in which it had been stamped out in 1887, under the sanction of the

highest court in the land. One had only to point to the photographs that perpetuated the bonfires fed by contraband telephones to prove that all attempts at competition with the great Bell company were illegal—things to be crushed under foot. There might be piratical opposition, but legitimate business competition, never. The Hubbard perpetual-monopoly idea was in full control. There was no surer way to arouse the wrath and contempt of Mr. Hudson than to suggest that there was really in existence a competing telephone exchange, the inroads of which should be met by the reduction of Bell rates, the installation of more modern apparatus, or the fairer treatment of the public. Anything but that! It might be necessary to buy the opposing rascals off, as one would other dangerous blackmailers, but to suggest that one should treat them as honest rivals, to be competed with for public favor by cheaper and better service was out of the question and not to be thought of for a moment.

A few Bell managers, who were being sorely pressed, ventured to make such suggestions; but they almost lost their official heads. Thereafter, when reports were made to headquarters of the opening of an Independent exchange, they were generally coupled with the statement that "the opposition is meeting with no encouragement, is making no progress, and will soon die out," or words to that effect. Opposition was never more than a flash in the pan to Mr. Hudson, even when he lay on his deathbed and a million Independent telephones were in actual operation. Now and then an exception was made and rates were lowered, but only toward the end, when Mr. Hudson had already begun to grow weak physically and lose control.

Just before the expiration of the controlling patent, in 1893, James E. Keelyn, of Chicago—who afterwards built dozens of Independent exchanges—went down to Boston to see Mr. Hudson. He pointed out that there were thousands of small towns in which the Bell company had never found it desirable to give service, or from which it had withdrawn because it could not get enough subscribers at the rates demanded. Mr. Keelyn suggested that he be allowed to develop these towns independently, and to equip them with apparatus that he would manufacture or buy in the open market, or from the Bell manufacturing company. He guaranteed to turn over all toll business to the Bell licensees that controlled the territory, building his own connections without cost to any of Mr. Hudson's underlying corporations. The proposition was rejected with scorn.

"Our contracts with our sub-companies," said Mr. Hudson, "give them exclusive operating privileges; if they do not choose to develop any town, or if they withdraw from it, they must have good and sufficient reasons. We will not tolerate any Independent exchange or break into our organized system. We cannot have dealings with you or anyone else."

It is certainly the irony of fate that the Bell people now have scores of high-priced agents in the field, canvassing for just such arrangements with the Independents, begging for toll-line connections, and offering to leave the local field entirely to the latter.

It is further irony that it is the Independents who are to-day fighting as an organization against such arrangements. As I write, I have before me a clipping from one of the technical journals, which illustrates in grim fashion this turning of the tables. It reads as follows:

"At a meeting of Independent telephone men of the eighth district of the Indiana Independent Telephone Association a resolution was passed pledging all Independent telephone companies of the district to refrain from any further service connection with any company that has a connection, direct or indirect, with any sub-licensee of the Bell company. The Independents have nearly everything their own way in the eighth district."

Experience has shown that, whenever any service arrangements are entered into between Independent and Bell companies, the Independent company ultimately passes under the absolute control of the Bell, and in the end is swallowed up. There have been quite a number of Independents who fell to this bait, but such instances are now rarer. When they occur, the Independents regard them as out-and-out Bell people. Reversing the old conditions, Independent connections are cut off, and the territory is rebuilt by a new Independent company, financed and managed locally. This is always made possible because, sooner or later, the former Independent company, under Bell stimulus, raises its rates and chafes its subscribers with the machine-made regulations turned out from Boston. The result is a new "uprising of the people," the granting of a new franchise, the sapping of the old exchange, and the upbuilding of the new.

CHAPTER XI.

ROMANCE OF THE BIRTH OF COMPETITION.

For romantic interest there is, probably, no chapter in our industrial history to compare with the story of the birth and growth of the Independent telephone movement. Here is a business that, to-day, represents over three hundred millions of capital. It employs over 25,000 workers and has more than 400,000 stockholders. It dominates the industry throughout the middle west and is fast creeping into control of the east and far west. It has nearly 4,000,000 people depending on it almost exclusively for service, and it is increasing this number at the rate of nearly twenty per cent a year. It has revolutionized the telephone business of the country and effected a saving of hundreds of millions for the public.

Yet, fifteen years ago, it had no existence. It came in the most humble way out of the most obscure places. It has had to fight its way, step by step, against the most powerful opposition ever offered on the industrial battlefield. The courts, politics, the public press, and millions of money have been used for its undoing. What, then, is there behind this movement, that it should have pushed on and on?

The answer is simple. It represents the crystallization, on a commercial basis, of a people's protest against extortion and unfair treatment. It embodies in business the spirit of American independence. Take, as an illustration, the organization of the first active and successful Indepent operating company in the present movement of which we have any record, the one at Noblesville, Ind. The Bell Telephone Company was operating eighteen stations in this town in 1893. For this limited service it charged $36 a year for residence and $48 for business telephones. All messages leaving the town had to pay heavy tolls. The service was poor and uncertain. The complaints of the people went unheeded. If a patron became too insistent, he was told there as elsewhere, that he might take the service or leave it. Years before, in 1885, when the Indiana state government had tried to come to the people's aid, it had only made matters worse. A law was passed fixing rates The Bell people attacked this law on constitutional grounds. When the courts sustained the law, the monopoly packed up its telephones and left the state. This brought the people to terms, but only after a four-years' fight. On petition the law was repealed, in 1889, and the monopoly went back on its own terms. Naturally, the people found it no easier to deal with after this, and the spirit of public resentment, strong everywhere in the United States where telephones were used, grew to be particularly pronounced in Indiana. But, for the most part, this resentment found vent simply in talk. Telephone subscribers in general, while complaining bitterly of their treatment, still accepted the monopoly as a matter of course, and believed that it must probably continue forever. There were two men in the state, however, who believed otherwise and prepared themselves accordingly. Both were destined to play im-

portant roles in the great Independent movement that later swept the country.

One of these men was P. C. Burns, now president of a large Independent manufacturing concern in Chicago. At that time Mr. Burns was located at Kokomo, where he was engaged in a small way as a manufacturer of dry batteries. Some years before he had been active in the telephone business, making apparatus in St. Louis for the opposition companies that had sprung up in the early days of the Bell patent. When the United States supreme court decision sustaining Prof. Bell's exclusive claim put these companies out of existence, in 1887, Mr. Burns' business, of course, was destroyed. But he made up his mind to go back into the field again at the first opportunity, and in January, 1893, he made the plunge. This was two months before the fundamental Bell patent expired, but Mr. Burns, inured to fighting the trust, waded in, nevertheless. He sent circulars broadcast offering to supply in any quantity "telephones exactly like those used by the Bell company." These circulars went to business concerns throughout the country. One of them, sent to the Citizens' bank, of Noblesville, fell on very fruitful ground, for it reached the hands of that other man in Indiana who had been preparing. This was E. L. Brown, the leading druggist of the place. Years before, while living in Pennsylvania, Brown had asked to have a telephone line installed between his home and the nearest railroad station. The Bell people offered to rent him two telephones at $100 a year and let him build his own line. This led him to investigate the cost of making telephones and opened his eyes to the outrageous prices asked by the trust. He determined then and there to go into the telephone business on his own account after the Bell patents should have expired.

Afterwards, when he had settled at Noblesville, the troubles of his neighbors and himself with the telephone service there strengthened this determination, and he waited only an opportunity to put his plans into effect. The favorable moment came just before the Burns' circulars were sent out. Brown was busy behind his prescription counter, one day, when Albert Church, the cashier of the Citizens' bank, came into the place in a raging frame of mind. Without giving the druggist a chance to ask a question, Church "opened up" on the telephone company.

"What have they been doing now?" asked Brown, sympathetically, when he could get in a word.

"Oh, the same old story—no service when you want it most—a breakdown somewhere—only this time it hurts worse than usual. I've lost a deal that meant hundreds, because the thing went bad. And then, on top of that, I got the regular dose from the manager."

"Could take the thing out if you didn't like the service?" suggested Brown.

"Yep—cut me off when I threatened to sue 'em, and told me they weren't guaranteeing service and I could sue till blue blazes. Say, but I'd go to the infernal regions to get even," Church ended, savagely.

"You needn't do that," Brown put in suavely; "I'll show you an easier way."

"How?"

"Start an opposition telephone company."

"Me? What do I know about the business? I'm a banker, not a lineman."

"Not you, Albert, but we. We'll start a company, you and I and the others who feel as we do."

And they did, Brown and Church, and a number of other solid men of the town who, for one reason or other—arbitrary treatment, poor service, high rates, and general meanness and incompetence—had been made as sore by the Bell Telephone Company as Church had.

They were, of course, badly hampered. They had no experience, no technical knowledge. The only man in the combination who knew anything at all of telephone apparatus was Brown, and his knowledge was purely theoretic. Worse still, they could get no apparatus. Brown traveled all over the country trying to induce manufacturers of electric appliances to make for them telephones and switchboards, but without success. The manufacturers were all afraid of the Bell patents, and had before them a knowledge of the things that usually happened to infringers of those patents.

When the promoters had become almost discouraged, the Burns circular came along. Brown went to Kokomo, and in a few hours he had completed a contract for the necessary telephones. There was still, however, the question of the switchboard. The Bell company had that part of the telephone machinery so thoroughly covered with patents, which still had long terms to run, that it seemed almost hopeless to try to get around them. Finally, even this difficulty was solved by the construction of a switchboard that reverted to the simple type used by the district telegraph companies. When these matters were adjusted the Noblesville people began to solicit subscribers, and in the late fall they started with seventy-five telephones installed, something hitherto unheard of in a town of that size. The first year they cleared thirty per cent on their capital of $10,000 (notwithstanding they had cut the Bell rates in half), and the Independent movement in Indiana and of the country was started on its course.

CHAPTER XII.

ENORMOUS DIFFICULTIES OVERCOME BY THE INDEPENDENTS.

Not long afterwards active telephone opposition manifested itself in other sections. Almost always these opposition companies came out of just such circumstances as those that had brought the Noblesville company into being. Telephone users, harried and annoyed incessantly by the monopoly, were given a glimpse of possible relief if they would take the business in their own hands, and scores of communities hastened to avail themselves of the chance. Companies began to spring up in many little towns.

These new companies all had the same troubles as those experienced in Noblesville with apparatus, and naturally their service was crude and generally unsatisfactory. Notwithstanding this, however, these little companies were invariably successful, and in most instances they practically put the Bell people out of business wherever they started in opposition. The public rallied to the support of the Independents, who were their friends and neighbors, and cheerfully put up with a poorer quality of service. Men came out of all walks of life to promote and manage these new companies. They were butchers and bakers, doctors and lawyers, clerks and mechanics, small business men, railroad men, farmers—men, in fact, from every station in life. Very few of them knew anything of the telephone business, except such facts as they picked up by painful experience. The trust had seen to it, from the start, that nothing relating to the science of the telephone art should become public. Its motto was "silence and suppression." There was no telephone literature, telephone press, or guide of any kind. To-day we have scores of telephone books and four regular technical periodicals devoted exclusively to telephony. But these have all come with the opening of the field by the Independents and their existence commercially is made possible only by the Independents. While, in some respects, it has changed its tactics during later years, the trust adheres to this day to its policy of "silence and suppression," so far as dissemination of knowledge of the art is concerned. This attitude is well illustrated by an experience related by the late Arthur Vaughn Abbott. Mr. Abbott was formerly chief engineer of the Chicago Telephone Company. While serving in that capacity he wrote an article on an engineering problem that had absolutely nothing to do with telephony. Immediate-

ly after this article appeared he received notice from the Boston headquarters that Bell employes were not allowed to write for the public press—lay or technical. Thinking a mistake had been made, the author pointed out the fact that his article bore in no way on the telephone business.

"That does not matter" was, in effect, the answer received from Boston. "You referred to cables in the article. True, they were bridge cables, but in mentioning the subject at all you might inadvertently have brought out some facts connected with telephone cables. In any event we prefer that persons connected with this company in any capacity do not write at all on any subject. There can then be no slips. Please govern yourself accordingly."

No other industry that I know of has ever had to suffer this peculiar blight of suppression. Railroading, mining, telegraphy, electric traction, electric lighting—all have had their literature from the very start, and those engaged in the business have been glad to give their support.

Telephony, too, at the start, had its literature in a halting sort of way for the exchange of experiences until the Bell obtained its absolute monopoly. Several small papers devoted to the art were started during the later seventies and the early eighties. But as soon as the trust came into unquestioned control of the business, these papers and every semblance of literature bearing on the art were crushed out, not to reappear until the Bell had lost its grip after 1893.

It was into such an uncharted industrial sea that the Independent telephone pioneers plunged. That they should have been able to keep from foundering is extraordinary. That they have finally succeeded, not alone in making harbor, but also in putting their great rival out of port in so many places, is one of the wonders of the industrial world. There is only one explanation of the phenomenon. The people were behind the movement. The spirit of popular protest that was organized in Noblesville was in existence throughout the country and pushed the Independents over the roughest places. Wherever this spirit was not behind the Independent promoters—wherever the opposition was on a cold-blooded commercial basis—the promoters generally came to grief. A shining example of this was the experience of the Harrison International Telephone Company, a huge stock-jobbing concern. This company was organized in December, 1893, with $30,000,000 capital. Its promoter, a man named Stone, came from Kansas City, Mo.

He had for his chief stock in trade some patents granted to Dr. Harrison, of Fort Smith, Arkansas, the same Dr. Harrison who had defied the supreme court, the trust, and all the other powers to put his little exchange out of business. The doctor's success had gained for him almost a national reputation. It was this reputation, as well as the patents, that Stone proceeded to capitalize. He secured for his stockholders and directors such men as R. C. Kerens, the millionaire political boss of Missouri, Stephen B. Elkins, Major William Warner, now a United States senator for Missouri, George R. Peck, general solicitor of the Milwaukee railroad, and others of equal prominence.

The main office of the company was established in Chicago and big branch offices were opened in Wall street, New York. The object, of course, was to float the stock of the concern, and a great deal of it was foisted on the public. Exchanges were erected in Decatur, Illinois; Topeka, Kansas; St. Joseph, Missouri; Norwalk, Ohio, and a few other towns of that character. These exchanges were a rank failure from the start, for the reason that, as one of the promoters subsequently confessed, "you couldn't hear a cannon through the Harrison telephone." Mr. Elkins and his associates withdrew from the whole enterprise within a year after it was started, but another crowd was induced to come in, and carried the enterprise along for twelve months more, when the bubble finally burst. The Bell Telephone Company bought what was left of the exchange apparatus and consigned it to the junk heap. The Bell got full value for its money, however, because of the capital it was able to make out of the failure of this "thirty-million-dollar opposition company."

Naturally the people who had been induced to put their money into the enterprise were thoroughly sore and disgusted and the unfortunate towns on which the Harrison company had experimented were up in arms against competitive telephony.

Notwithstanding this setback and the further setback that came from the failure of a number of other stock-jobbing enterprises, the real Independent movement continued on a solid and growing basis. It was confined almost wholly to the smaller towns. Each company was officered and capitalized locally and made no effort to spread beyond its territory. Because of this and the co-operative nature of these organizations, they almost invariably adopted the name of the Home Telephone Company. This practice continues to this day.

The continuation of Mr. Latzke's telephone story will be found in the June TELEPHONY. The next installment will be very interesting. The story may be had in book form at 25 cents per copy. Address TELEPHONY, Manhattan building, Chicago.

P. & A. TELEPHONE REPORT.

AT THE recent annual meeting of the Pittsburg and Allegheny Telephone Company it was shown that the corporation has enough copper wire in use to circle the globe twice, 50,000 miles; operates 22 exchanges in Allegheny county, owns six exchange buildings, valued at $300,000, has 16,000 telephones and a switchboard capacity of 35,000 calls, and last year handled more than 60,000,000 telephone calls.

More than 32,000 of the 40,000 shares which make up the company's capital was represented at the meeting, when the following directors were elected: J. G. Splane, John S. Waller, Robert C. Hall, D. P. Reighard, R. H. Binns, H. B. Beatty, R. E. Flinn, H. McSweeney and George R. Webb. All are residents of Pittsburg except the last two. The directors elected the following officers: President, J. G. Splane; vice-president and general counsel, John S. Weller; treasurer, Robert C. Hall; assistant treasurer and secretary, Thomas G. Davis. The following appointments were made: Auditor, C. F. Bender; contract agent, Frank Hart; chief engineer, Mr. Mihlheizler; superintendent of service, E. W. Hatfield; superintendent toll department, H. E. Webb.

The annual report of President Splane showed a healthy financial and physical condition of the property, revenues for the year being in excess of those of the preceding year. The total amount placed to surplus account for the period ended December 31 was shown to be $678,219, and the property is valued at $5,756,000.

An appropriation for carrying on new construction during the year was made.

In addition to its overhead wires the company has 1,500,000 feet of underground duct.

SERMONS BY TELEPHONE.

A DISPATCH from Paducah, Kentucky, says that for the first time in fourteen years Mrs. Sarah Shelton, an invalid, heard a sermon last night, and heard it while in bed at her home. Mrs. Shelton is paralyzed, and has been confined to her bed for years. She is a devout member of the First Baptist Church, and, expressing a desire to hear a sermon, Rev. M. E. Dodd, the pastor, had the telephone in the church arranged so he could preach into it, and Mrs. Shelton heard every word of the service distinctly, including the singing of the choir. Other members sick and unable to attend church also enjoyed the sermon by telephone.

IMPROVING TELEPHONE SERVICE

Fort Worth Telephone Company Adopts a Plan Whereby Employes are Encouraged to Offer Suggesstion.

By Lloyd E. Knapp.

THE Fort Worth (Texas) Telephone Company has adopted a scheme to improve the service which may prove helpful to other Independent companies. Each month the management proposes to give a prize of $5 to the employe who submits the best suggestion how to improve the telephone service. In March there were eleven letters written to the company, embodying suggestions of employes. In announcing the result of the contest the company issued a bulletin which reads as follows:

The suggestions by the employes of the Fort Worth Telephone Company for the month of March have been very carefully considered by a number of disinterested persons. Each suggestion was considered for its full worth from a business standpoint and each of the disinterested persons making up the body that decided as to whom the prize should go, worked on the percentage basis. That is, as each suggestion was read, each person noted his opinion of the suggestion from a business standpoint on the percentage basis, one hundred per cent being a perfect mark. After all of the suggestions were marked and the reasons for percentages discussed thoroughly, an average of the percentages noted was taken. This is simply by way of explanation of the methods by which the first prize of $5 was awarded.

The prize this month goes to Jesse F. L. Clack, whose suggestion heads the following list, it having received a percentage of eighty. The following are the suggestions as offered, together with notations explaining in a degree the dispositions of the suggestions and the reasons for the percentages given:

SUGGESTION NO. 1—AVERAGE PER CENT, 80.

"I would suggest the following in regard to the ringing circuit methods employed on the switch board. At present there is a resistance of two lamps on each position of the board, a 'high' and 'low.' These lamps are of comparatively small resistance, and when several operators ring at the same time upon lines which are crossed or short, it throws a heavy load on the ringing machine and therefore increases power consumption.

"Again, we almost daily receive trouble reports from the operators, stating that bells do not ring, and upon testing the line find it 'open.' This shows that the operator should have a slight audible signal when ringing a subscriber whose circuit is crossed or normal. The apparatus which gives this signal should allow of only a slight current consumption upon the short or crossed lines, which the present resistance lamps do not do. Therefore, I would suggest that a pair of ringer coils of the polarized type, one thousand ohms, be introduced in each ringing circuit in series with the resistance lamp. This would give a signal which would show that the circuit was closed, and in case of a 'short' line would prevent loading down the ringing machine, and from the character of the sound inform the operator that the line was 'short,' and that she would be unable to get the party for whom she is calling. I would suggest equipping several positions in this manner and trying out this suggestion."

The prize of five dollars ($5) for the best suggestion was awarded on this one, not because of the technicalities introduced, nor because of the construction, but because the subject involved indicates a thoughtfulness on the part of the originator in seeing where losses occur that are not readily apparent, and also for suggesting a remedy. As we have often said, the little suggestion may be worth as much as the large one, and in this case it has proven worth more. The item of power consumed by the ringing machines is in itself a small item, but the tone of the suggestion in its entirety suggests that the originator has his eyes open for the small leaks, which in the aggregate during the year eat rapidly into our revenues.

NO. 2—AVERAGE PER CENT, 75.

"A suggestion I would like to offer is that the trouble men be furnished with a soldering outfit to solder all jumpers or drops that are not, and that they endeavor to see that everything is properly fused and the cable given the necessary protection. On days when trouble is light, have them make an inspection of as many telephones as possible, or, in other words, a general inspection, something the plant has never had since it has been in operation."

This is a good suggestion, and would materially reduce maintenance costs, where properly followed out. It might be well to suggest in this connection that the trouble men should be ever on the lookout for defects in the plant or any possibilities of any interruptions in the service. The suggestion that a general inspection be made when trouble is light is very good, and we recommend that such a plan be followed out by the trouble men.

NO. 3—AVERAGE PER CENT, 72½.

"We find that we lose a large number of subscribers for the reason that they get impatient waiting to be advertised in the directory. I would suggest that not to exceed every sixty days there be printed and delivered to subscribers a supplemental directory. It is fully as necessary in my opinion to hold the subscribers that we have already solicited and installed, as it is to secure new ones. I think you will get good results from this suggestion."

This suggestion is a good one and is one that we have been considering seriously. The fact that our subscribers' list is growing so rapidly compels the issuance of an entire directory, the compilation of which will commence at once.

NO. 4—AVERAGE PER CENT, 70.

"I would suggest that leads and drops be given a thorough inspection at once, for the following reasons: March is a month in which we have some very violent winds. Our construction on the whole is in fair shape, but there are a great many places where our wires have slackened down upon the electric light wires. We use a sixty cycle current for ringing our 'high' party line telephones and when we become crossed with a sixty cycle lighting circuit, it rings all of the 'high' party line telephones on the plant. As this usually occurs during the night, and sometimes continually until morning, at intervals, this trouble is only partly caught by carefully watching and listening to the relays while it is occurring. This being crossed with the electric light circuit is becoming painfully frequent, in fact, every time we have a stiff wind it occurs; therefore this suggestion."

This is a good suggestion, tending toward the betterment of the service, but would not have been necessary had the city and our employes always looked after lines properly. In this connection, it will be well to advise that the matter

has been taken up with the city, and the commissioner has agreed to make a thorough investigation of this condition tending to eliminate or in some manner alleviate it at once.

NO. 5—AVERAGE PER CENT, 70.

"This circuit (circuit referred to is modification of arrangement for giving church service over the telephone) is submitted with the view to overcome some of the faults which developed in the severe test Sunday morning, in which it was shown to be far from being sufficiently powerful.

"I was plugged in on one of the seventy jacks which he had installed from the beginning to the end of the service. The telephone which I have is a Stromberg-Carlson and of course quite powerful in receiving qualities.

"When there were about three hundred subscribers connected, the transmission was not even audible to me, nor was it until all connections had been taken down, and then only seventy had been connected again. This brought it up so I could hear the prayers and sermon distinctly. The hymns were only moderately distinct.

"A very annoying feature was the conversation the people insisted on keeping up during the service, some of this being of a profane nature, cat-calls, whistling, etc. This is, of course, hard to control, but I am under the impression that if the transmission had been audible and clear that we would not have encountered this feature, as it subsided with the improvement of the transmission.

"To return to the circuit and theory of its operation, I would suggest a flaring mouthpiece for the transmitter, which should be under no circumstances less than six inches in diameter and should if possible be twelve inches. Next, by cutting our battery wire in series on the two sets of batteries at the office, we could command forty-four volts of power for transmission purposes. This would enable us to cut four or less primary windings of talk-through type repeating coils in series on our transmitter circuit. The number we could use in series would depend upon their resistance, of which the four together should not exceed one hundred ohms.

"On the secondary, or listening side, two windings should be connected in series through two micro-farad condensers on each set of two coils. The series connection gives high electro-motive force and the two micro-farad condensers prevent magnetization of the repeating coil cores by current from the subscribers' plugs and tend to a better electrical balance.

"The reason for dividing the multiple of seventy jacks into two portions is to prevent the drop in electro-motive force by halving the number of telephones connected at one time, and also to diminish by half any disturbance any one tries to start while listening or which is done unintentionally by buttons or sleeves coming in contact with the telephone transmitter while holding the receiver to the ear, etc.

"One more disagreeable feature was that caused by the operator, who while listening, would throw the key associated with cord used in answering the call and get in listening circuit and of course could be heard calling 'number.' As a further suggestion, I would say that any line that is noisy or is heavy induction should not be connected with the circuit at all.

"I would also suggest that you inquire of some one else who was connected through the service, as my condition may have been more or less favorable, or the opposite."

While this is a good circuit arrangement and suggestion and one that will naturally assist our endeavors along the line of advertising the service of the Fort Worth Telephone Company by means of popularizing the church service, it is one that has no essential bearing upon the operation of the plant and therefore not as valuable as others of that nature. This criticism must not be construed, however, as being inimical to the suggestion, but rather on the contrary, pointing out that those suggestions regardless of technicalities having the best business ideas, or ideas that will result in the greatest good to the greatest number, will be more valuable.

NO. 6—AVERAGE PER CENT, 45.

"The lights of the switchboard are trying to the operators' eyes. I would suggest that they be changed."

This suggestion is one that, having to do with the health and nervous systems of the operators, tends to improve the service as we concede that the operator cannot work to the maximum degree of efficiency when her eyes are under a strain, consequently this suggestion has been acted upon and the lights on the switchboard have been changed.

NO. 7—AVERAGE PER CENT, 42½.

"Make an extra effort to get correct addresses on all orders issued to workmen. In the past a great deal of valuable time has been wasted, due to same."

The trouble experienced in incorrect addresses on orders has been due to the duplication of streets and numbers in the city. This trouble and the possibility of further mistakes will be entirely eliminated by the new street and number arrangement of the city engineer's department.

NO. 8—AVERAGE PER CENT, 35.

"I suggest that Southwestern operators not be allowed to visit our retiring room, as the affairs of this office are repeated at their office."

The rules of this company do not permit of the entertaining of visitors in the operators' retiring room by employes. Therefore, an observance of posted rules does away with the necessity of a suggestion of this nature.

NO. 9—AVERAGE PER CENT, 32½.

"I think that if the keys on the switchboard were kept in perfect order operators would be able to give better service."

All operators should immediately make note of any trouble with keys or cords on the position on which they are working. This notation should be immediately transferred to the wire chief in order that the keys may be repaired promptly. The suggestion is a good one, but it comes under the heading of natural requirements and should not be necessary.

NO. 10—AVERAGE PER CENT, 32½.

"Chief operator's desk would give better service if cams were in perfect order."

Notation on number nine applies also to this suggestion.

NO. 11—AVERAGE PER CENT, 32½.

"We suggest that the office help and operators not be allowed to mix, as the operators will not respect the rules."

This suggestion is good as far as it goes, but we are inclined to believe that if the suggestors consider the matter in its various lights, they would agree that an operator should have will power sufficient to keep her from taking advantage of any courtesies that may be shown her by those in a position to do so. It is not desired by the management of this company to draw a hard and fast line between sets of employes, but rather that we operate together amicably and to the best advantage in the nature of one large, happy family. Such a condition as this is not possible, unless petty jealousies are overcome and due appreciation is shown by the various employes without trespassing beyond ethical lines laid down by good sense.

CUMBERLAND TO WITHDRAW.

THE Bell has made up its mind to quit Madisonville, Kentucky. The Cumberland Telephone and Telegraph Company has refused to come to Mayor I. N. Vickers' conditions and has issued a letter to its patrons announcing that it will close its exchange there on the night of July 31, 1908, and remove from that city.

CHEMISTRY IN TELEPHONY

By P. Kerr Higgins

CHEMISTRY shows all substances to be made up of various combinations or simple forms of matter which cannot by any other known means be subdivided into other kinds of matter. If we take sugar and subdivide it we find it to contain three elements—1. carbon, 2. oxygen, 3. hydrogen. An element is an indivisible form of matter, which so far we have been unable to break up into other forms of matter. Elements in combination form atoms and molecules. A molecule is the smallest particle of matter left after dividing by mechanical means and yet retaining all of its original properties, or the smallest quantity of matter that can exist by itself. An atom is the smallest particle of a substance that can exist not alone but in combination with other atoms, thus forming a molecule; hence we may define atoms as molecules, subdivided by chemical means. From the above we may deduct that all changes are made by physical (mechanical) or chemical means. When the change is by physical means we have molecules which retain the same properties as before the change. When change is by chemical means we have the atoms which may completely change the nature of the substance and create new forms of matter of entirely different properties. All the atoms of a molecule have an attraction for each other which holds them together in combination and gives exactly the same weight. Molecules cannot be formed by atoms which have no attraction (known as chemical affinity) for each other. While it has not been definitely stated it would appear that all substances or matter is absolutely dependent upon electricity (so-called) for its existence as such, a law of attraction and repulsion being apparent in chemistry as in electricity and acting in a somewhat similar manner, although not so demonstrative as we are accustomed to find in applied electricity. In chemistry elements are known by symbols and (as the alphabet in language) are designated by a letter or letters, usually the first letter of the name of the element is used. The following table shows some of the principal elements used in telephony:

ELEMENTS.

Name	Symbol	Atomic weight	Physical condition	Specific gravity	Electro chemical equivalent Grains per column
Aluminum	A 2 4	27	Solid	2.60	.00009324
Antimony	S b 3, 5	120	"	6.71	.00024860
Arsenic	A s 3, 5	75	"	5.73	.00015540
Bromine	B r 1, 5	80	Liquid	3.187	.00082100
Cadmium	C d 2	112	Solid	8.60	.00058020
Calcium	C a 2	40	"	1.88	.00020720
Carbon	C 4	12	"	3.6	.00003098
Chlorine	C 2 1, 5	35.5	Gas	2.45	.00036730
Copper	C u 2	63.3	Solid	8.95	.00065680
Gold	A u 1, 3	196.5	"	19.32	.00204400
Hydrogen	H 1	1	Gas	.0069	.00001036
Iron	F e 2, 4, 6	193	Solid	7.86	.00029010
Lead	P b 2, 4	207	"	11.37	.00107200
Magnesium	M g 2, 4, 6	24	"	1.74	.00012590
Manganese	M n 2	55	"	8.03	.00028490
Mercury	H g 2	200	Liquid	13.55	.00207200
Nickel	N i 2, 4	58	Solid	8.90	.00030040
Nitrogen	N 3, 4	14	Gas	.971	.00002911
Oxygen	O 2	16	"	1.105	.00008288
Platinum	P t 2, 4	195	Solid	21.5	.00101000
Potassium	K 1	39	"	.87	.00040520
Silver	A g 1	108	"	10.53	.00111800
Sodium	N a 1	23	"	.978	.00023800
Sulphur	S 2, 4, 6	32	"	2.05	.00016100
Tin	S n 2, 4	118	"	7.29	.00061640
Zinc	Z n 2	65	"	7.15	.00033820

It will be noted that some of the symbols used have letters from the Latin or Greek names, which sometimes causes confusion until one becomes familiar with the terms. When we use the term specific gravity (as in the electrolyte of the accumulator which is 1,200) we mean that it is 1,200 times as heavy as water. In computing specific gravity we use water as the unit. We then find the weight of a given volume of the substance whose specific gravity is wanted and the weight of an equal volume of water. Then divide the weight of the substance by the weight of the water, which gives us the specific gravity desired. When atoms are weighed the term atomic weight is used. In this case we use hydrogen as the unit, as its atom weighs the least of all the known atoms. The atomic weights are given in the foregoing table. It is well to note that when gases are considered, the same temperature and pressure must be used. This is known as "vapor density," and is weighed same as atomic weight, using the same unit. The molecular weight of gases is twice their vapor density. Molecular weight is obtained by adding together the weights of all the atoms in the molecule under consideration. A compound is a combination of atoms and is usually called by names taken from the elements of which they are composed, such as H_2SO_4, which is the symbol of sulphuric acid. Two fundamental laws are known and recognized in chemistry, namely, 1. Conservation of matter, which is "the sum of the weights of all the products in an experiment is exactly equal to the sum of the weights of all the factors involved." 2. Definite weight,—any chemical compound always contains the same elements in the same ratio by weight. It will be noted in the table that the symbols show Roman numerals behind the letters. These denote the valence of the element. The affinity of hydrogen is used as the standard for measuring valence; hence its valence is known as 1. Atoms which will not combine with hydrogen will usually replace it; hence the valence is the number of hydrogen atoms which one atom will hold or replace.

Equations in chemistry is an algebraic expression to denote a chemical change or combination and affords a ready means for separating the factors and defining their parts by weight. It also represents the substances in combination, the proportions used and the product of the combination. Thus, if we combine sulphuric acid and copper, we have Cu + S, and by reference to the table we see that Cu has a weight of 63.3 and sulphur 32; hence we have 63.3 + 32. The equation is then

$$Cu + S = CuS$$
$$63.3 + 32 = 95.3$$

This may be carried out to divide and subdivide any combination desired, and may also be used to make up any desired combination. Acids are from a chemical standpoint extremely active, and are a compound containing hydrogen, which can be very easily exchanged for a metal; when added to a carbonate they give off gas and have a sour taste. Alkali is formed by a metal of basic substance displacing one atom of hydrogen in H_2O, forming a hydrate. The product formed by neutralizing an acid is called a salt. Solubility is the power of a substance to be dissolved in water when the water has taken (or dissolved) all it can contain. This point is known as "the point of saturation." By heating the solution it is then possible for it to dissolve more, except in the case of gases. If after being heated it is cooled off, the surplus solid will be thrown out of the solution in the form of crystals. This explanation has frequently been given as the cause of the crystals forming in the LeClanche battery, the battery having been "shorted"

or discharged too fast the internal resistance produces heat which in cooling off forms the crystals as explained, and the slower the cooling process the more perfect the crystals. The same also solves the crystals formed by sugar. Some of the principal elements entering into telephony are: 1, oxygen; 2, water; 3, nitrogen; 4, carbon; 5, graphite; 6, sodium; 7, acids. Oxygen is one of the most important elements; it permeates and forms the largest portion of the air, earth and water. In minerals and water it is found in chemical combination in air with gases. It is colorless, tasteless and odorless and soluble in water, has great affinity for combination with other elements; hence oxidation and decay. It is used to advantage in the hydrogen-oxygen blow pipe for soldering the plates of accumulators together, the combination of the gases in combustion producing intense heat. It may be produced by heating chlorate of potassium $KClO_3$, the heat sets free the oxygen; to avoid the explosive effects it may be mixed with a little black oxide of manganese, such as used on Le Clanche cells.

Without water the science of telephony would be almost, if not impossible. In the electrical field (as in others) it is indispensable. It may be termed a solid, a gas or a liquid as it varies from one stage to the other according to the temperature. It is formed by oxygen and hydrogen. The kind of water used in telephony is important whether used in primary or secondary cells, as it should always be pure soft water, such as distilled water or pure rain water, which has not been allowed to come into contact with substances soluble in water. Water is purified by being distilled, which is simply condensed steam, leaving the impurities behind, the steam being lighter and more volatile. The method commonly used for distilling water is to have the liberated steam pass through a coil (or worm) of pipe which is immersed in cold water. The "flat taste" of distilled water or "lack of life" is caused by the air and carbon dioxide having been expelled. Hard water usually is found to contain lime or salts in solution, hence when soap is used it combines with the salts and forms a scum of the surface. Water containing bicarbonate calcium should not be used in boilers or other metal vessels as it forms a crust or scale on the metal.

Nitrogen.—This gas may be obtained from air; it also forms an important part of ammonia NH_3. It may be extracted from air by means of phosphorus, burning out the oxygen leaves the nitrogen, the air being confined in a jar. Again the oxygen and phosphorus may be dissolved in water leaving nitrogen.

Carbon.—This element is found in three forms: 1. Graphite. 2. Diamond. 3. Amorphous. The two former are crystalline in character; the third is not. Graphite is commonly known as plumbago, black lead, etc., and coal is a production of it. It apparently originates with plant life. It is insoluble at ordinary temperatures, is used in telephony for resistance, and as a lubricant, also for protectors, as it is almost infusable to lightning and other high tension currents. Amorphous carbon is found in the form of charcoal and is produced from wood burned, the heat produced decomposes the wood, expels the gases, leaving charcoal, which is a solid, black, porous substance, tasteless and odorless, and has the property of keeping and making water pure. It is insoluble. Lamp black is another form of amorphous carbon and is made by partially burning resin, tar, etc., and collecting the unburned carbon. Another form is coke produced from soft coal. Diamonds are pure carbon crystallized and is the hardest known natural substance. Carbon (or graphite) is used very extensively in telephony for the variable resistance on transmitters and also in nearly all forms of primary batteries used for open circuit work. It will absorb the color in liquids; it will also absorb gases, and in combination with chemicals makes a splendid disinfectant. It will also absorb bad odors, and in combination with oxygen forms dioxide and monoxide of carbon. Gas carbon is a scale and is used for the carbons in arclights.

The well-known acids in telephony are: 1. Nitric acid (HNO_3). 2. Sulphuric acid (H_2SO_4), and hydrochloric acid (HCl).

Nitric acid when pure is colorless. The commercial acid is frequently colored and is about sixty per cent pure. It is one of the best solvents for metals, and is frequently used for cleaning metals before lacquering them. It is produced from heating nitrate of soda and sulphuric acid and condensing the nitric acid given off into glass or earthenware vessels. Hydrochloric acid is made by heating common salt with sulphuric acid by a special process called the Le Blanc process. The commercial form is known as muriatic acid, used by telephone men to dissolve zinc producing a good flux for soldering iron wire, etc. It should, however, never be used on copper wire because of its corrosive effects. Sulphuric acid is well known to telephone men, being used in all forms of accumulators. It is one of the most important acids. It is made from sulphur and iron pyrites, FeS_2. The sulphur is burned to sulphur dioxide, or oxygen in the form of water is added to make the acid. It is very cheap. It is made usually in sheet lead chambers, the sulphur being burned in kilns; the gas passes through a tower taking up NO (nitrogen, oxygen) gas and moisture; it then passes through another chamber filled with steam, the sulphuric acid forming a white mist and settling down in the bottom of this chamber. It is then evaporated in lead pans to form the thick liquid known as oil of vitriol, which is about ninety-five per cent pure. Copper sulphate, known as blue vitriol ($CuSO_45H_2O$), is used in gravity batteries (open circuit work) in the form of blue crystals. It is also used for copper plating, etc. Sal ammoniac or ammonia chloride (NH_4Cl) is used in the form of crystals for primary batteries for open circuit work, also as a flux for soldering irons and in galvanizing iron, etc. Both of these chemicals are termed salts.

Batteries.—A battery in telephony consists of one or more voltaic cells connected either in series, parallel or a combination of these two methods and are of two kinds: 1. Primary. 2. Secondary, or accumulators. Both of these depend for their operation on chemical action or changes which take place between two different elements in contact with each other through a chemical fluid (called an electrolyte). It is here noted that an electric current passing through a conducting fluid will decompose it and set free the various elements in proportion to the current flowing. It is also believed that all chemical action between conducting bodies produces electricity. Theoretically the action taking place in the cell is that when the two elements (having a chemical affinity for each other) are placed in the electrolyte a stress or difference of potential is created between the elements. This stress may or may not cause chemical action and it is very desirable that it should not unless the terminals of the elements used are connected together by a conductor. When chemical action does take place on open circuit it is called local action. Normally, however, in the best open circuit batteries the atoms having combined have given up most of their energy and so remain in the original combinations, but when the outside terminals are brought together or connected together by a conductor the existing stress equalizes itself and causes current to flow which decomposes the electrolyte, changing its character and breaking up the existing combinations, hence restores the various atoms. Their potential energy and the liberated atoms, uniting with the anode, keep up the current flow. The two elements are usually known as the cathode and the anode. The latter is the metal element in the cell, the cathode being merely a conductor to afford a ready means of connecting to the electrolyte. As soon as the current ceases to flow the elements, because of their chemical affinity for each other, tend to reunite and produce an opposing electro-motive

force. The total weight of any substance liberated in this manner is found as follows:

h—heat.
E—Volts.
Q—Columns.
Z—The electro-chemical equivalent.
W—Weight (in grains) of liberated substance.
C—Current, Z—time.

Thus $W = Q \times Z$.
& $Q = C \times Z$ = Columns.

The table is used to find Z, which is the electro-chemical equivalent in grains per column. The electrical work done in joules may be found by the formula:

$$\text{Joules} = 4.2 \times Q \times Z \times h$$
$$\text{or joules} = E \times Q,$$

hence $E \times Q = 4.2 \times Q \times Z \times h$, and dividing the equation by Q we have $E = 4.2 \times h \times Z$, being the answer in volts.

Polarization of Cells.—The formation of hydrogen gas on the surface of the cathode is known as polarization and its removal depolarization, the agent used being known as depolarizer. The depolarization may be done by either chemical or mechanical means. If by chemical means a substance having plenty of oxygen in it is used with the hydrogen, will unite and the cathode is surrounded with this such as manganese in dry and Le Clanche cells.

Polarization decreases the voltage and increases the internal resistance, and depolarization increases the voltage and decreases the resistance. When mechanical means is used, the liquid may be excited or the cathode taken out at intervals and cleaned. The chemical process is by far the most satisfactory. The metal chosen for the anode must be one whose salts have a high heat formation value such as potassium, sodium, magnesium, etc. Therefore in a good cell the metal should not be attacked by the exciting liquid except when being decomposed by the passage of current, hence the popular use of zinc for the anode. In addition it is the most efficient metal at a reasonable price.

The voltage of various sulphates are as follows:

Element.	Formula with S O 4.	Voltage.
Potassium	K 2 S O 4	2.35
Zinc	Z n S O 4	1.32
Lead	C d S O 4	.90
Tin	S n S O 4	.88
Iron	F e S O 4	.83
Aluminum	A Z e S O 4 e	.70
Copper	C u S O 4	.47
Silver	A g S O 4	.30

CELLS IN COMMON USE IN TELEPHONY.

Fuller Cell, used for long distance transmission and telegraph work, is a bichromate formation, is a good cell and economical to use if properly cared for. It consists of a glass jar containing the depolarizer (made of an electrolyte composed of three parts potassium bichromate dissolved in eighteen parts of water, with four parts of sulphuric acid). This is diluted about one-half, using rain or distilled water. Into this solution is hung the carbon element. In the depolarizer is set a porous cup into which is placed a small quantity of mercury. The zinc is like a cone, and into it is fastened the copper conducting wire. This is done so that the zinc may be well amalgamated by the mercury. It is important that the zinc and the copper wire be thoroughly amalgamated before being put into the cell. The exciting liquid may be of salt water, sulphuric acid or ordinary water; by adding the salt or the acid the cell forms ready for use more quickly. It is also customary to connect the zinc and the copper together (on short circuit) for a short time before putting into use. The voltage of this type is about 2.2 volts and the internal resistance one ohm.

Gravity Cell.—This cell is used on operators' transmitters and for telegraph and fire alarm purposes. The name indicates the peculiar character of this cell, which, while in use (which it always should be, being a closed circuit cell), keeps the two liquids separate caused by the chemical action. If current is not kept flowing the liquids will mix and decrease or destroy its efficiency. The top solution is zinc sulphate and is transparent; the lower liquid is copper sulphate, being a very pretty blue. The latter should come up about two inches above the copper plate, and be well defined and of a good blue color. The copper is practically indestructible if properly cared for, the deposits on it can be carefully broken off and the copper is found as good as new. The zinc is destroyed by the action of the cell and has to be replaced at times. It is also necessary to draw off some of the zinc sulphate. The zinc element weighing three pounds is usually in the form of a "crowfoot" and the copper like a six-point star made of sheet copper, to which is riveted the copper wire leading out of the cell. The sulphate of copper is added in the form of blue crystals (blue stone) and should be dropped into the solution (water) and scattered around the copper leaves. These copper leaves are two inches wide and six inches long in three strips riveted together. Two pounds of sulphate is sufficient for the charge. The internal resistance is .05 ohm and the voltage slightly over one volt. The specific gravity of the zinc sulphate should not be over 1.15. If over this draw off and add pure soft water The Le Clanche cell is still used and has a solid depolarizer in the form of manganic oxide MNO2 (known as manganese). The positive element as usual is rod zinc; the liquid (electrolyte) ammonium chloride Nh4C1 (known as sal ammoniac). This should always be used in the crystalline form and not the powder. The negative element is carbon, surrounded by the depolarizer, and may be in blocks (baked) or in powder form in a sack or in a porous cup. By mixing crushed coke with the manganese the internal resistance may be reduced. Weight of zinc rod used, three ounces, and five ounces of sal ammoniac is usually sufficient for a charge. The solution must be entirely changed after two zincs are consumed, and the porous cup changed after six zincs are used up. Discoloration of the porous cup (rusty color) indicates necessity for change. The life of this cell is about thirty-five ampere hours, voltage 1.5 volts and internal resistance 4.5 ohms. The principal chemical action is the formation of zinc chloride and ammonia and the reduction of the oxygen combined with the manganese.

Dry Cells.—The dry cell has also a solid depolarizer and the electrolyte is conveyed through porous material such as paper, coarse cloth, sawdust, mineral wool, etc. This electrolyte is combined with a gelatine substance such as isinglass, heated, then poured into the zinc case and allowed to cool. Several makes are used but the foundation of nearly all of them is similar to the Le Clanche, except the electrolyte, in which the changes take place, some using potash, sal ammoniac, etc. This form of cell is very cheap and very convenient, and is replacing wet cells for open circuit work very fast. The difficulty experienced with this type of cell is that it is difficult to seal them well to prevent evaporation. They are also soon exhausted. They can frequently be renewed by boring a hole through the sealing on each side of the carbon and allowing them to take up as much fresh sal ammoniac solution as possible, again sealing them up with a hot iron. The voltage, current output and internal resistance varies considerably with each variety of this form of cell.

Summary on Primary Cells.—Briefly the following should be borne in mind in the use of primary cells: 1. All materials should be of the best. 2. Binding posts firm and free from corrosion. 3. Prevention of creeping of the salts by using paraffine or oil. 4. Carbon element should be of dense gas retort carbon, zinc element free from impurities such as iron, arsenic, etc. Sal ammoniac should be chemically pure and can be tested as follows: Add to a solution of sal ammoniac a small quantity of barium chloride

and hydrochloric acid. If the solution does not change color the sal ammoniac is pure. Another test is to burn the sal in the flame of an alcohol lamp and if pure it will evaporate in white fumes and leave no residue.

Secondary Batteries or Accumulators.—The introduction of the central energy systems made the accumulator an absolute necessity, and to-day it is one of, if not the most, important features apart from the telephone itself. Their advantage over primary cells is their low internal resistance, ability to deliver a high voltage without polarization at low cost. They are flexible, reliable, take up small space and are clean and easily maintained. The fact that they can be re-charged and last for years gives them an economical advantage over all other cells, and they can be used for open or closed circuit work. In practice it is found that we use about .5 ampere each twenty-four hours per hundred subscribers. There are four varieties: 1. Lead-sulphuric acid. 2. Lead-copper. 3. Lead-zinc. 4. Alkaline-zincate. The first is the commercial type of to-day and needs only be considered in telephone work. The present cell is practically a combination of the Faure and Plante types, the positive plate being of the latter and the negative plate of the former type. The positive is a firm plate and composed of an alloy of lead with five per cent antimony and having round holes twenty-five thirty-secondths of an inch in diameter into which is pressed the active material, being corrugated strips seven-sixteenths of an inch wide which expand completely and fill up the holes during the electro-chemical formation process. The negative plate has the holes filled with lithage (Pbo) paste (spongy lead), covered with perforated lead sheets, and has a greater capacity than the positive plate, the positive plate increasing its capacity and the negative decreasing during charging. During charging the accumulator is considered as a primary cell, hence the current flows from the positive to the negative outside of the cell, and inside the cell it flows in the opposite direction. The voltage of each cell is about two volts, the quantity of a cell depending on the size and number of the plates. The plates are separated by glass strips. The electrolyte consists of one part sulphuric acid to five of water; specific gravity from 1,180 to 1,205. The resistance is almost .005 ohm. The following chemical changes take place: Lead sulphate is formed at both plates, the sulphur being taken from the electrolyte leaving a molecule of water instead of a molecule of acid, thereby weakening the solution and reducing the specific gravity. It is supposed that the peroxide of the positive plate changes first to monoxide and then to sulphate. This action is reversed during the charge, metallic lead being deposited on the negative plate. Recently the negative plate has been changed in character and is frequently made up on two plates with the spongy lead between them.

Two distinct actions take place: 1. During charge. 2. During discharge. In charging the lead sulphate is broken up and forms lead peroxide (PbO_2), which is deposited on the positive plate, metallic lead being formed in the negative, sulphate passing to the solution forming H_2SO_4 the chemical action is understood to be $2PbSO_4 = Pb + PbO_2 + 2SO_3$. The reverse of this takes place during discharge, the action being represented as $Pb + PbO_2 + 2H_2SO_4 = 2H_2O + 2PbSO_4$, hence during charge the specific gravity continues to rise till fully charged and the reverse during discharge. Charging rate on account of local losses in the cells should be twelve per cent higher than discharge rate, and the latter should never be exceeded.

The terminals of a battery of cells may be connected up temporarily by means of lead bolts and nuts or permanently by soldering them together with an oxy-hydrogen burner. or gas may be used for hydrogen and air for oxygen. The gas should have a pressure of eight pounds per square inch; no flux is necessary. If soldered with an iron, pure tallow should be used as a flux. In mixing the electrolyte care must be taken to pour the acid into the water and not water into the acid, otherwise intense heat is generated and will cause damage. Always use chemically pure water, such as distilled water, for making up the electrolyte. Allow the electrolyte to cool before pouring into the cells. The plates should be covered by fully a half-inch. In charging care must be had in connecting up to see that the positive plate of the cells is connected to the positive of the charging machine and the negative to the negative, otherwise the polarity of the cells will be reversed and ultimately disintegrated and cannot be recovered. To find the polarity (if a volt or ammeter is not available) dip both ends of the charging wires into a vessel of slightly acidulated water and it will be noted that one wire has more bubbles than the other, the greater number of bubbles being on the negative wire. The wires should be about a half-inch apart.

A cell or battery is considered fully charged when the specific gravity ceases to rise and each cell shows 2.5 volts during the charge. The charging rate may be found by dividing the ampere hours capacity by eight or you may find the capacity by multiplying the charging rate by eight. Theoretically we should get one hundred ampere hours per pound of active material, but in practice we only get about sixteen. Cells should never be discharged below 1.9 volts. When the cell is in good condition the negative plate should be of a clear steel gray color and the positive a deep chocolate brown. There should be no white patches (sulphating) nor twisting (buckling) of the plates. Too low a charging rate or too little produces the former and too high or too much charging the latter. In putting a cell out of commission the cell should be fully charged, then take the plates out of the acid and store away properly protected. When more than one plate is used the negative element has one more plate than the positive. The average life of a cell is seven years properly cared for at a safe discharge rate. Daily readings should be kept showing the charge and discharge, together with voltage readings and hydrometer readings of the specific gravity. On account of the gasing of the cells during charging it is well to keep the room well ventilated and to cover the cell with a glass top. Purity of the electrolyte is imperative, and the things to be avoided in addition to pieces of metal are: 1. Nitric acid. 2. Mercury. 3. Copper. 4. Iron. 5. Salts. 6. Chlorine. The first may be found by adding diphenylamine in pure sulphuric acid to a small quantity of the electrolyte. If nitrates are present it will show a blue color. The presence of mercury is found by adding lime water to the electrolyte. If present a black or yellow precipitate is found. Copper is found by adding hydrochloric acid and potassium ferricyanide. A blue or green color is noticeable if present. Chlorine is found by adding silver nitrate, which forms a white precipitate. If properly cared for and protected by glass plates the addition of acid is seldom necessary, but on account of evaporation distilled water should be added when the top of the lead plates become exposed. This should be done during charging. All wood and metal work in the battery room should be painted with ashlap paint and all exposed metals properly protected against corrosion. In charging the applied electro-motive force must be greater than the counter electro-motive force of the cell, otherwise no current can flow. About eight per cent of the applied electro-motive force is expended in forcing the current through the cell, hence in using ohms law to find the current ($C = \frac{E}{R}$) it is necessary to add the electro-motive force of the cell to the applied electro-motive force to obtain E in the formula. The exact chemical changes taking place in accumulators is not known, and their average life, while given at seven years, varies greatly according to the work required of them and their care.

Manufacturer's Department

By W. H. Graffis

PARTY LINE TELEPHONES FOR FARMERS AND RANCHMEN.

OF ALL the improvements that the application of electricity has wrought during the past century, it has undoubtedly been left to telephony to bring about the greatest change in the mode of transacting business that any invention of man has ever produced. This was true when the telephone was first introduced in the central station system for intercommunication in and between large cities. Its usefulness has been further developed by its introduction on what are known as party lines for farmers and out-of-town residents. The value of this improvement can only be realized when one realizes the number of telephones that within the last few years have been installed for this purpose. All telephone manufacturers have at present almost all the

G. W. Johnston, president Western Electrical Supply Company, Omaha.

orders that they can take care of for some time to come, most of which are for what might be termed rural service. There has been a noticeable difference in this service between different sections. The east has been kept quite well equipped with rural lines, while the far west has somewhat lagged behind. The middle west is well developed. There may be different reasons to account for this condition, but there is no doubt that one of the most important is that the far west has not the number of electrical supply houses that can be found in the east. It is true that a company may order from any part of the country through any supply house, no matter how far distant it may be; but it will be admitted by every experienced buyer that the nearer you are to the source of supply the easier it is to purchase and the easier to remain in close touch with the place of purchase.

It is very gratifying to those engaged in telephone work to know that this disadvantage is now entirely removed, and the people of the west have already shown their appreciation of the fact, so that rural telephones are going into the western country now about as fast as anywhere. The main reason for this change is that the Western Electrical Company, 411-513 South Tenth street, with thorough insight into the electrical business and understanding the requirements of the local trade, has decided to carry in Omaha a full and complete line of all electrical supplies, construction material and apparatus of all kinds including a full stock of "Western" telephones. In selecting the "Western" telephones there is no doubt that the Western Electrical Company has displayed the same good judgment that characterizes their stock in general, namely, to handle only good articles of every kind, for although there are many good telephones on the market, the "Western" ranks among the very best. The Western Electrical Company is the direct agent for electrical apparatus, including lead and paper insulated cable and double galvanized BB telephone wire, and is able to sell all goods at the same price that would be made at factory. The Western Electrical Company of Omaha is one of the pioneer electrical supply houses in the

New building Western Electrical Supply Company, Omaha.

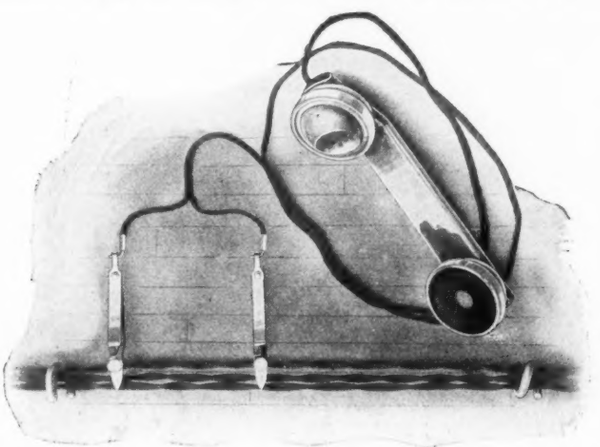
middle west. This company succeeded the Midland Electric Company, which operated in Omaha prior to 1886. Through its long and intimate relations with the patrons of its territory it is able to exercise discretion in the culling of the trade and to carry in its stock in Omaha only the kind of goods that are wanted. It is always able to fill its customers' orders with intelligence, knowing and understanding the local conditions of its territory, which is a very important factor in the proper filling of orders.

In conversation with G. W. Johnston, president of the company, it was learned that the increase of the business of the Western Electrical Company is one that is certainly worthy of mention and most gratifying to the electrical trade. About five years ago when the management plainly saw what the demand for telephone material and apparatus would be in western territory, it was decided to carry a stock in Omaha which would at all times be able to supply all of the needs of the trade. The result of this is that the company is now carrying in Omaha carloads of cross-arms, oak and locust pins, oak brackets, iron telephone wire, glass insulators, pole steps, machine bolts, lag screws, carriage bolts and a thousand and one little items that are necessary

and used in the equipment and maintenance of a telephone exchange. From that time on the Western Electrical Company has nearly doubled its business from year to year, and it is safe to say that it is to-day doing a great part of the electric light and telephone supply business in the middle west. There is great credit due the company for its contribution to the development of the telephone business of its territory. The company is splendidly equipped in its executive offices and is well represented in the field, having five regular traveling men constantly on the road. It maintains what might be termed a bureau of information, which was found necessary in order to be of proper service and accommodation to its customers in solving problems and giving advice in so many of the little intricate points of the telephone business which, although they seem insignificant, still require expert knowledge to solve. The aim of the company seems to be to please its customers, and the means it has chosen to do this is by prompt and proper fulfillment of all orders in every little detail and by the accommodations to the trade which it is necessary for large houses to give their customers. It is not wholly the purpose of this item to advertise the Western Electrical Company, but to place credit where credit belongs, and there is no doubt that when we express our appreciation of the efforts that the Western Electrical Company has put forth and the results it has accomplished in spite of all obstacles to further the development of telephony in the middle west, we are joined by a host of friends among their patrons. If there are any engaged in telephone work in the territory of the middle west that have "troubles of their own" we can only give them the advice to go to The Western Electrical Company, Omaha, Nebraska.

THE WILLIAMS TEST CLAMP.

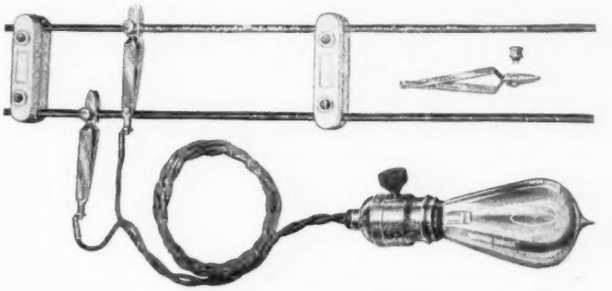
THE Williams test clamp manufactured by the Williams Test Clamp Company, Cleveland, Ohio, is a new device for telephone testing and is intended for use on the ends of the connecting cords of any type of test set. When clamped on a wire the steel jaws force the needles through the insulation without harming it and a perfect test connection with the conductor is made. It is a tool manufactured of the best spring steel and the strength of the spring composed of the jaws of the clamp is amply sufficient to maintain a perfect contact during the making of any test by its own pressure



Williams test clamp with needles in use on a common battery test set.

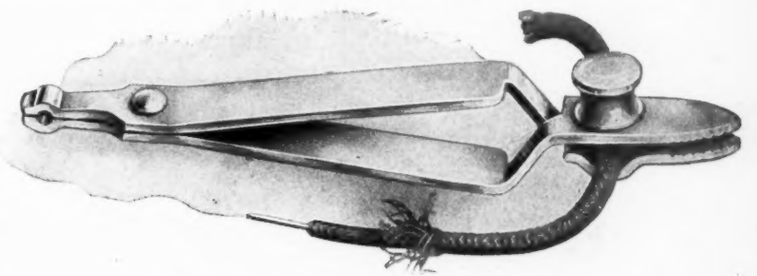
penetrating the insulation to the conductor without pressure from the outside. The clamp is instantly attached and will make contact with any size of bare or insulated wire from No. 40 gauge magnet wire to No. 14 gauge drop wire. The nose of the clamp is knurled for use in testing on bare wire or on a terminal head.

On fastening the Williams' test clamp to the connecting cord no binding post is required and soldering is not necessary. A standard telephone cord tip will fit tightly in the hole in the heel of the clamp. The Williams' test clamp as shown in the accompanying illustration can be used on a



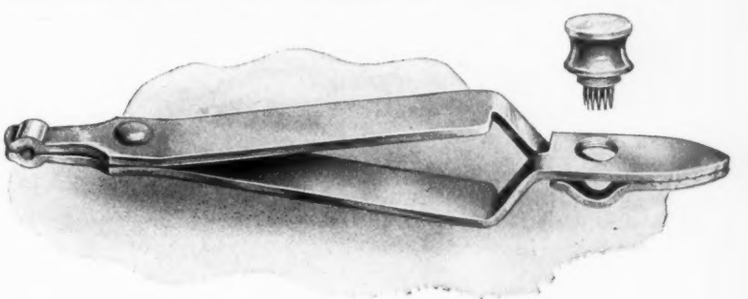
Clamp used in an emergency.

common battery telephone test set of the microphone type with the needles penetrating to conductors of an insulated twisted-pair. The long pointed nose of the clamp is for use



Actual size of Williams test clamp.

on any bare terminals, such as cable terminal heads, switchboard connecting racks or pin boards. The clamp is a great time saver and lessens the work of the lineman. The Wil-



Williams' test clamp with stud removed.

liams' Test Clamp Company has recently prepared some interesting literature of its specialty, which, with prices and samples, will be mailed upon request.

W. C. POLK.

FEW men in the telephone field are better known than is W. C. Polk of Toledo, Ohio, who has been actively engaged in the telephone business during the past thirteen years. Mr. Polk is forty years old and was born and reared in Highland county, Ohio. His early education was acquired at his native town, New Vienna. Graduating from the local high schools he immediately entered the Ohio State University at Columbus, graduating with honors of C. E. In the year 1895 he entered the services of the Central Union Telephone Company, having charge of all its conduit and cable underground systems throughout the states of Ohio, Indiana and Illinois. He later served as assistant general foreman for the same company and also in the capacity of superintendent of construction of the northern Ohio district, which position he resigned June 1, 1901, to enter the ranks of the Independent telephone companies, realizing that it offered a much greater scope of action and greater

possibilities than the old company. In June, 1901, he took charge of the engineering work of the Central Construction Company, since which time he has constructed the plants at Toledo, Ohio; Louisville, Kentucky, and Kansas City, Missouri, and put in service over 45,000 working subscribers' lines, installing five million lineal feet of cable, including both underground and aerial.

NEW FACTORY OF THE UNITED STATES COIN REGISTER COMPANY.

THE accompanying illustration shows the new factory recently occupied by the United States Coin Register Company of Monroe, Michigan. The building is designed and built to meet the special requirements for the manufacture of its new combined cash register and pay station. It is located on a fine site of six acres and is in the shape of the letter H, affording every advantage of light for fine work. The office is two stories high and is divided into various apartments with every modern improvement. The factory has a floor capacity of 12,000 square feet. The equipment is of the very latest improved type, thereby enabling the firm, with the aid of skilled help, to produce the very best results in the manufacture of the new devices. The firm is now in a position to furnish any demand for its new recording pay station and insures prompt deliveries.

New factory of the United States Coin Register Company.

WINNERS OF THE ANDRAE PUZZLE.

PRIZES have been awarded to the following successful winners of the Andrae puzzle which appeared in the April issue of TELEPHONY: Roy Pelham, De Witt, Ia.; C. O. Chapmen, Wilkesville, O.; H. L. Thomas, Ashland, Kans.; C. A. Ballentine, Wellsburg, W. Va.; Ernest J. Miller, Parma, Mich.; G. H. Woodworth, Troy, Pa., R. No. 63; Wm. Wynne, Raleigh, N. C.; K. G. Cornell, Afton, Ia.; Ora Flint, Liberty, Ind.; H. M. Ruleson, Wagoner, Okla.

The correct answer to the puzzle is as follows—

The destruction of batteries in the telephone is due to defective hook switch springs which may be bent when removing the hook, or from other causes, and if the metal of which they are made is not sufficiently elastic, they will remain bent and fail to disconnect the primary circuit when the receiver is hung up. This leaves the batteries constantly on a short circuit through the low resistance of the primary winding of the induction coil and the transmitter. The remedy is to use the best metal obtainable in the manufacture of hook switch springs. The best material that can be had for this purpose is phospher bronze which is used altogether in the Andrae Giant telephone.

NEWEST AND SMALLEST RECEIVER.

THE L. M. Ericsson Telephone Manufacturing Company, Buffalo, New York, has recently perfected and placed upon the market a miniature receiver which is adapted to being placed in the auditory canal of the ear and which requires no outside support whatsoever. The accompanying illustration shows this unique receiver, and also the relation which its size bears to the regular hand type. The diameter of the miniature receiver is but ¾ of an inch and its depth ½ inch, excepting the part which is inserted in the ear. This follows the auditory canal in the same manner as a phonograph earpiece, and the closer the small bulb at the end approaches the ear drum, the louder the sound.

Miniature receiver enlarged 2½ times.

Because of the vari-shaped ear passages, the bulbs are made in different types and are interchangeable.

New Ericsson miniature receiver.

The case, or shell of the receiver, is made of the most expensive Wolfram electro steel, produced in electric fur-

naces, and after being formed into the proper shape, is carefully hardened. The difficulties connected with this operation may be easily imagined, as the wall is but 1-32 of an inch in thickness. The core and coil are then placed in the finished shell and properly magnetized. In order to prevent the fine windings from being torn, the tiny tinsel cords are attached firmly to the back of the case. This miniature receiver is particularly adapted to take the place of the old style operator's head set and on account of its light weight and freedom from the uncomfortable and unsightly headband, can be worn with greater comfort and convenience and requires but a short time for the operator to become accustomed to its use. On account of its small size, it can hardly be seen when in position in the ear, which fact renders it of decided importance in connection with the many instruments used for assisting the deaf to hear. Many interesting tests have been made with this little apparatus, one of which was to successfully enjoy a telephone conversation over a toll line five hundred and sixty miles in length.

THE LUCAS ANCHOR.

THE Equipment Sales Company, Chicago, has placed upon the market an anchor presenting interesting qualities. It is claimed to be a perfect guy anchor, put together with unusual mechanical skill. The Lucas anchor purports to be practically indestructible, the rod and eye being the same, it is said, as one solid piece. Another of the strong points claimed for it is that it will not "creep." The Lucas is claimed to be a perfection of the Stombaugh basic principle through the addition of a number of valuable improvements.

Anchor showing wrench.

Ready for installation.

Lucas anchor.

The anchor appears very easy of installation, as no digging is necessary. For these reasons, also, it is said to be a money-saver, both in time and labor, as well as in first cost. The Lucas anchor is reported to be meeting with favor among telephone, telegraph, electric light and railway companies. The Equipment Sales Company has issued some interesting descriptive literature which, with prices and samples, will be forwarded upon request.

THE MOORE CALENDAR FOR MAY.

ALFRED F. MOORE of Philadelphia believes that a profitable investment could be made in his wires and cords for the construction period and will guarantee prompt shipments. The artistic May calendar as reproduced here-

with is exceedingly attractive and bears the interesting Moore talk as follows:

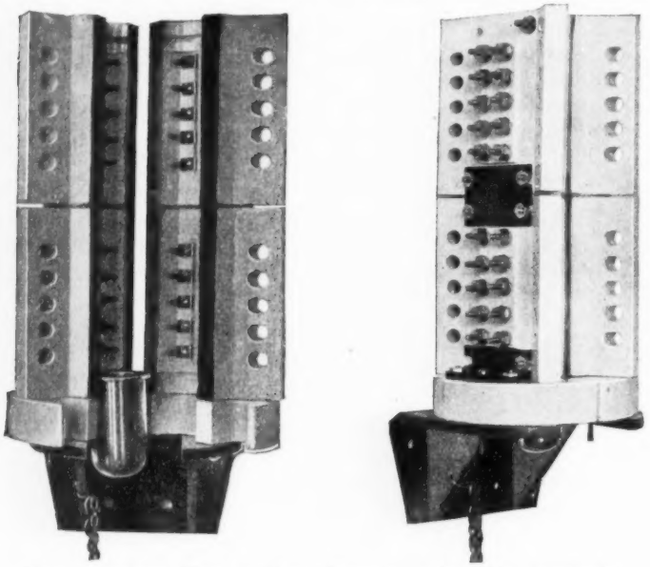
"Now is the time to order hard drawn twisted pair drop wire; duplex inside wire, all standard colors; weatherproof wire; galvanized iron wire; bare or covered. We carry a complete stock. Will you reciprocate by sending us an order? At least give us a chance to quote on the wires and cords you are going to buy."

NEW PORCELAIN POLE CABLE TERMINAL.

THE American Electric Fuse Company, Muskegon, Michigan, has recently made an improvement in its pole cable terminals as illustrated herewith, which show an unprotected lock nut terminal made entirely of porcelain. It is strong and substantial in construction, and is designed to occupy a small amount of space, giving at the same time plenty of room for the cable and bridle wires. The porcelain part is mounted on malleable casting and is so arranged that the terminal portion can be easily removed without interrupting the service. This is a new feature it is said, that no other terminal on the market possesses. To make the cable connection in the terminal, the bolts that hold it together are removed and the two bottom bolts holding the terminal on the casting are loosened. The base is then arranged so that it can be opened and free access to the terminal where the cable wires solder can be had. The cable in the terminal is first passed through the lead nipple at the base, stripped and the wires soldered to the clips and a joint wiped between the lead nipple and the cable.

The terminal is then closed, bolts fastened and tightened and the center compartment filled with compound.

This construction is done quickly, it is said, and is less expensive than any other type. Being made of porcelain,



New American Electric Fuse Company pole cable terminals.

the terminal is weather-proof and the parts are heavy enough to stand rough usage without breakage.

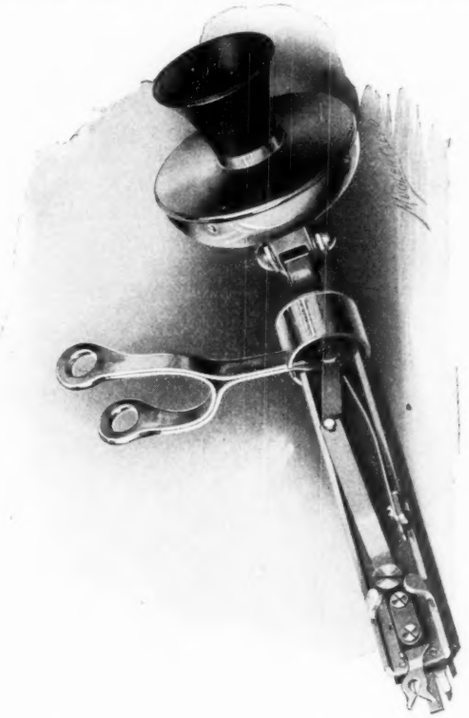
The American Electric Fuse Company will be pleased to furnish all interested parties with circulars and prices upon request.

NEW DEAN DESK SET.

MOST every operating telephone company charges a higher rate for service when desk set instruments are furnished. Such an increase in rental has been justified by the larger maintenance expenses. The average telephone

Dean desk set.

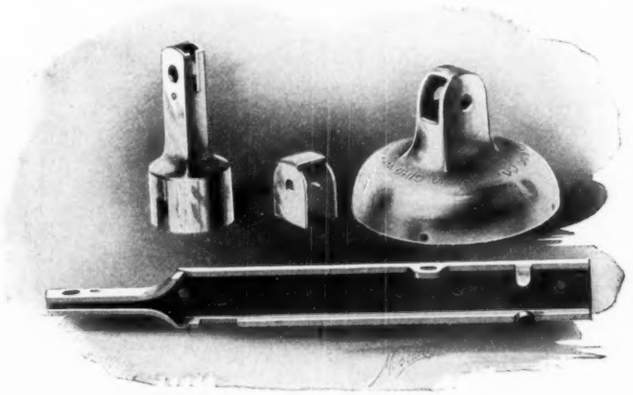
user expects to pay more for a desk set than for a wall set, it being more convenient and the liability of breakage increases the amount of repairs required. Now with the telephone using public educated to pay more for such service, suppose that the maintenance of desk sets could be reduced to a figure as low as similar charges for wall types. Then if the higher rate would continue for the desk sets, the earnings of the exchange would be materially increasing



Desk set showing transmitter and switch-hook automatically inserted in place.

and the desk set business would be a big money maker.

This opportunity is now offered, it is claimed, by the use of the improved desk set now being sold by the Dean Electric Company. The only source of trouble with the type formerly manufactured by this company was the breakage of cast parts. In the new style, all castings have been eliminated by the substitution of parts drawn from cold sheet metal. The framework is composed entirely of steel and the large center stem extends from the base to the transmitter mounting shell, which is bolted directly to the piece.



Desk set showing dis-assembled parts.

The exposed nickel plated parts are drawn from brass, since it has been conclusively demonstrated that this metal takes a more durable plating and provides for surface that is absolutely rust-proof. The new set is absolutely unbreakable even with abusive use. The improved Dean desk set costs no more to maintain, it is said, than the best wall instruments.

The Dean company supplies a composition transmitter mouthpiece and receiver shell that is sold at about half the cost of the hard rubber article. It is claimed that this com-

position is more durable and equal in appearance to hard rubber. This certainly offers an excellent opportunity to reduce the maintenance on all subscriber's instruments to a very low figure.

EUGENE L. BROWN.

EUGENE L. BROWN has just accepted a position as sales engineer with the Vote-Berger Company of La Crosse, Wisconsin, after testing its central energy or common battery system and new non-induction coil central energy or common battery telephone.

Mr. Brown is one of the oldest Independent telephone

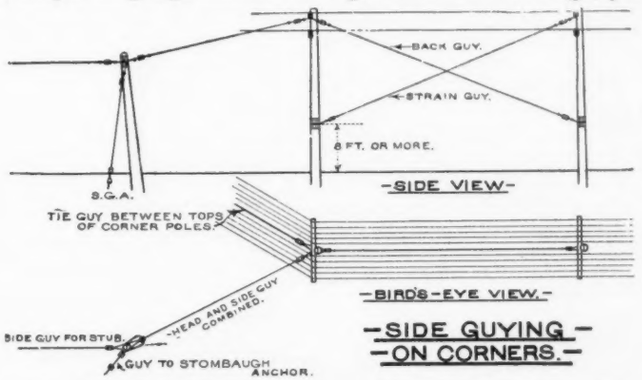
Eugene L. Brown, sales engineer, Vote Berger Company

men in the field, having taken up the work of organizing Independent telephone companies and selling telephone apparatus in 1893; representing the American Electric Telephone Company for about six years, first in the west and then in the states east of the Ohio state line, with offices at Pittsburg, Pennsylvania; resigning this position to accept a similar position with the Stromberg-Carlson Telephone Manufacturing Company, because he saw the possibilities of central energy or common battery system, at that time a new thing and not manufactured by any other telephone manufacturing companies.

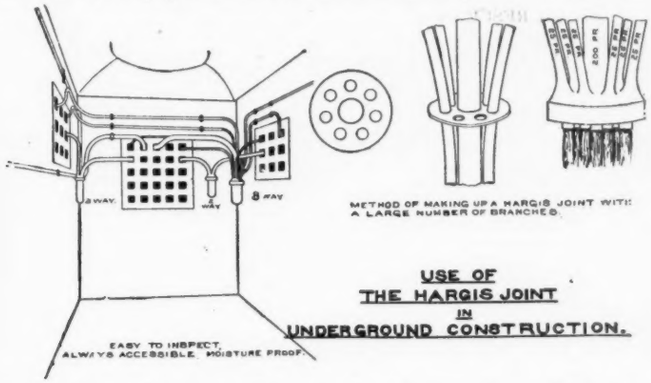
He will devote most of his time to demonstrating the advantages of the Ballast system and non-induction coil telephone and will be pleased to hear from telephone companies who wish to see a demonstration of the advantages gained by adopting the Ballast system or the non-induction coil telephone. Mr. Brown will make his headquarters at 519 Dempster street, Evanston, Illinois.

TELEPHONE LINE CONSTRUCTION BOOK.

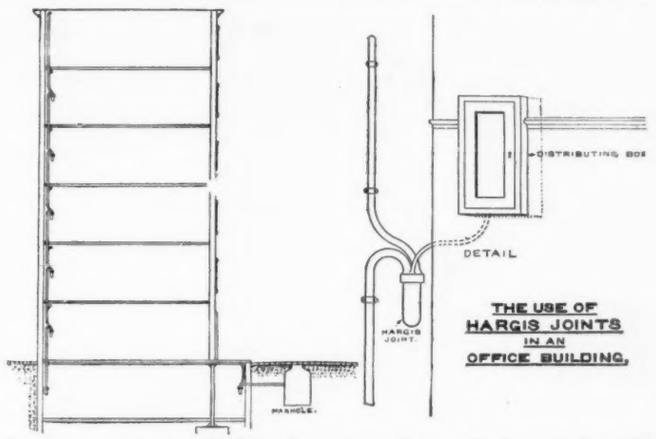
W. N. MATHEWS & BROS., St. Louis, have recently issued a neat book entitled "Telephone Line Construction" which is full of information which any telephone man should be more than glad to have, as its pages explain in simple language and clear diagrammatical drawings, just



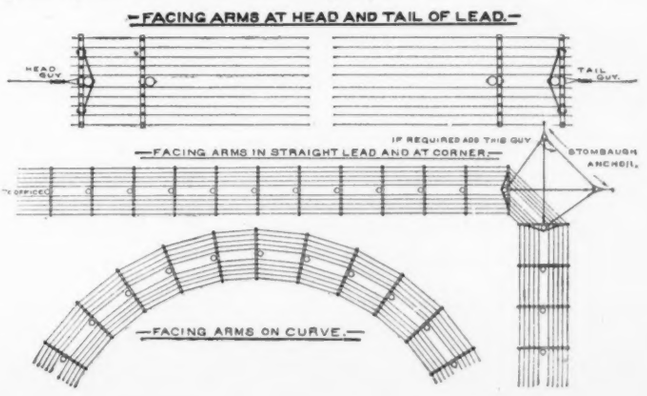
how a telephone line should be constructed. It is printed on fine bond paper and bound in a strong neat cover. Re-


METHOD OF MAKING UP A HARGIS JOINT WITH A LARGE NUMBER OF BRANCHES.
USE OF THE HARGIS JOINT IN UNDERGROUND CONSTRUCTION.
EASY TO INSPECT. ALWAYS ACCESSIBLE. MOISTURE PROOF.

productions of pages 28, 29, 108 and 112, (two-thirds actual size) are reproduced herewith. Each operating tele-



phone company will be given one free of charge for the asking if the letter is written on a company letterhead and signed by an officer of the company.


-FACING ARMS AT HEAD AND TAIL OF LEAD.-
HEAD GUY.
TAIL GUY.
IF REQUIRED ADD THIS GUY.
-FACING ARMS IN STRAIGHT LEAD AND AT CORNER.-
STOMBAUGH ANCHOR.
-FACING ARMS ON CURVE.-

TRADE NOTES.

THE GORDON BATTERY COMPANY announces the removal of the general offices to Aldene-Roselle, New Jersey, where it hopes to be able to take care of its ever increasing business.

GEORGE R. BLACKBURN, Cleveland, Ohio, is issuing to the trade a series of artistic picture calendars descriptive of the Blackburn ground clamp, which can be had upon application.

THE F. BISSELL COMPANY, Toledo, Ohio, is issuing to the trade a series of cards illustrating the various activities of the Bissell trademark frog which will be sent to all interested parties.

THE CRESCENT TOOL COMPANY, Jamestown, New York, has recently issued an artistic pamphlet descriptive of its complete line of lineman's pliers. Prices and samples will be sent upon request.

THE APPLETON ELECTRIC COMPANY, Chicago, Illinois, is distributing to the jobbers, contractors and electrical engineers an interesting catalogue on Unilets. Inquiries by mail will receive prompt attention.

THE AMERICAN ELECTRIC TELEPHONE COMPANY, Chicago, Illinois, has recently issued its latest bulletin, No. 14, on construction materials and supplies, which will be sent to all interested parties upon request.

THE AMERICAN CONDUIT COMPANY, New York, has recently issued its Bulletin No. 242. The company makes a specialty of underground construction, and is prepared to furnish any information upon request.

THE STROMBERG-CARLSON TELEPHONE MANUFACTURING COMPANY, Rochester, New York, is sending out interesting information relating to its ironclad magneto telephones in the form of a pamphlet which can be secured upon request.

THE GENERAL STORAGE BATTERY COMPANY, Boonton, New Jersey, has ready for distribution to the trade its Bulletin No. 9, descriptive of its permanized Plante negative plates, which will be forwarded to all interested parties upon mentioning TELEPHONY.

THE HABIRSHAW WIRE COMPANY, New York, has recently issued a price list and catalogue which contains a full set of prices on the different wire bases and is replete with various information on the subject of its wires and cables. Copies may be had upon application.

THE MOON MANUFACTURING COMPANY, Chicago, Illinois, reports that it will be permanently located in its new factory, 23-25 S. Jefferson street, after May 15th. It will occupy larger and more commodious quarters which will enable it to take care of its rapidly increasing business.

O. E. CHANEY & COMPANY, Minneapolis, Minnesota, has prepared an interesting circular on commercial electricity investments. This concern makes a specialty of telephone propositions and maintains an engineering department to inspect and report on exchanges installed or about to be bonded.

GEORGE T. WESTCOTT, 315 Chamber of Commerce building, has been appointed sales agent for Chicago for the Driver-Harris Wire Company, Harrison, New Jersey, manufacturers of resistance wires and ribbon, copper, brass, German silver, phosphor bronze, nickel, aluminum magnet, binding and music wires, telephone cords, lamp and heater cord, as well as all kinds of special cords.

THE FARR TELEPHONE AND CONSTRUCTION SUPPLY CO., Chicago, has recently issued its bulletin, No. 101, which contains a complete price list of its series and bridging telephones and which illustrates and describes the company's compact cabinet type telephone. Copies can be had upon mentioning TELEPHONY.

THE INTERNATIONAL TELEPHONE MANUFACTURING COMPANY, Chicago, Illinois, reports a heavy demand for its special neighborhood selective country party line telephones, equipped with the International loud speaking transmitters and receivers. These telephones, it is said, are especially adapted for rural lines, where the instruments are usually required to care for themselves.

THE C. A. MANUFACTURING COMPANY, Austin, Texas, has recently made some comparative germicidal tests with its wood preserver to determine the value as a preservative. Bacteria and fungi which are the cause of decay in wood were subjected to treatment with water which had been in contact with the wood preserver and were killed immediately. Detailed information on this subject will gladly be sent upon mentioning TELEPHONY.

THE HARRISONBURG MUTUAL TELEPHONE COMPANY, Harrisonburg, Iowa, has contracted with L. M. Ericsson Telephone Manufacturing Company, Buffalo, New York, for the furnishing and installing of a complete common battery multiple switchboard, a three-position country line switchboard, chief operator's and wire chief's supervisory desks, power and storage battery equipment and main protectors. The company expects to reconstruct its entire plant and will place all the business section of the city in underground conduits as well as installing considerable overhead cable. The local exchange has connection with the various exchanges and lines of the Rockingham Mutual Telephone Company of this county, which gives them connection with more than 1,200 rural telephones.

THE SWEDISH-AMERICAN TELEPHONE COMPANY has recently furnished the Stark County Telephone Company of Toulon and Wyoming, Illinois, with two complete central office equipments, each consisting of a lamp transfer magneto switchboard with an ultimate capacity of 400 lines, with 250 lines installed. Among others that have recently placed orders for complete equipment with the Swedish-American company are Berthold Telephone Company, Berthold, North Dakota; Shambaugh Telephone Company, Shambaugh, Iowa; White Lake Telephone Company, White Lake, South Dakota; Farmers' Telephone Company, Union Hill, Illinois; Smyrna Telephone Company, Smyrna, Michigan; Sparks Telephone Company, Dorset, Ontario, Canada; Chase County Telephone Company, Imperial, Nebraska; Green Telephone Company, Waynoka, Oklahoma, and Farmers' Telephone Company, Seiling, Oklahoma. The demand for Swedish-American equipment throughout the Southwest is especially active at this time, an average of four carloads of telephones being shipped from its Kansas City branch each month, indicating a good quality of healthy business for a product that is universally popular among telephone buyers.

A NEW IGNITION DEVICE FOR GAS AND GASOLINE ENGINES.

THE Chicago Coil Company, 48-50 Jackson boulevard, Chicago, has placed on the market a new and interesting ignition coil, ordinarily termed a jump spark coil. This device is known as The Cartridge jump spark coil on account of its form and construction.

Two views of this device are shown. Figure 1 shows the complete assembled coil, and Figure 2 shows its parts dissembled, illustrating the method of constructing a device of this kind so that any part may be readily replaced in case of trouble instead of requiring the whole coil to be

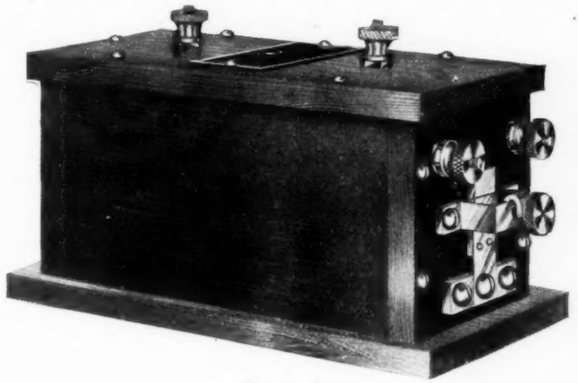


Figure 1.

discarded when damaged. The most frequent source of trouble with spark coils is the breaking down of the condenser, which costs but a fraction of the total value of the complete device, so that the advantage of the cartridge construction is readily apparent. The secondary windings are contained in the larger box, while the smaller one is the condenser. The vibrator, primary winding and core are of a unit with the end of the outer case and these parts may be removed without breaking any connections in the primary circuit.

The secondary cartridge as well as the condenser cartridge make their connections automatically when inserted in the containing case.

The outer case is made with lock corners of clear maple nicely finished, and trimmed with nickel-plated binding posts, screws and vibrator parts, the finished article presenting a handsome appearance.

This is a very high-grade article, the success of which is

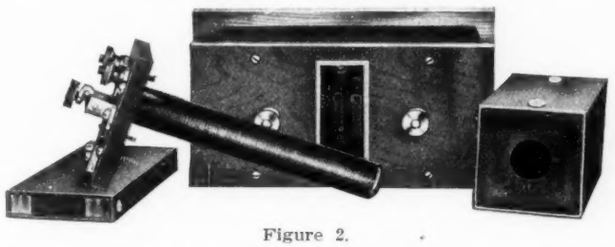


Figure 2.

assured because it is being sold at a price not greater than the ordinary old-style coils now on the market.

Several of the larger gasoline engine manufacturers in the United States have adopted this device and others are booked for the next year's requirements of a large number of smaller firms in the business.

This company expects to put out automobile coils in the near future built on the cartridge plan, as a number of automobile manufacturers have asked for this type of coil.

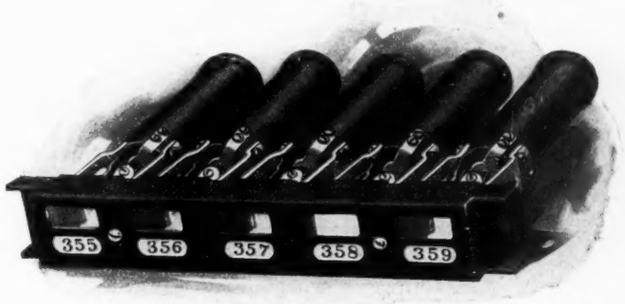
Patents have been applied for in the United States and foreign countries on the cartridge coils, which are the invention of Mr. Harold D. Stroud, well known in the telephone field.

The Chicago Coil Company has the general sales office at 48-50 West Jackson boulevard, Chicago, and its product is manufactured by the American Electric Fuse Company of Muskegon, Mich., where a separate department has been started for this line with ample facilities for an output of several thousand cartridge coils per week. American Electric Fuse Company's black enameled wire is used exclusively in the construction of the cartridge coils, which insures a very high class of insulation in the windings.

These coils are used with stationary gas engines and motor launches and the Chicago Coil Company will be glad to send literature and prices to telephone men and supply houses throughout the field who desire to represent this line in their territory.

MONARCH VISUAL SIGNAL TYPE.

THE Sioux City Telephone Company recently purchased from the Monarch Telephone Manufacturing Company, of Chicago, a 120-line private branch switchboard and has installed it in the Mondamin Hotel at Sioux City, Iowa. It is of the common battery visual signal type and is equipped with 95 local lines with three trunks each to the automatic and toll. The accompanying illustration shows a strip of five visual signals of the type used in this board, and an attractive feature of its equipment is its simplicity, as it requires no adjustment. The armature is pivoted on permanent bearings and the core is attached permanently to the shell, keeping the distance between these parts always the same. The armature is balanced in such a way that it is easily drawn up and restored by gravity the instant the cur-



Strip of five Monarch visual signals.

rent is withdrawn from the coil, the arrangement being such that a positive and reliable operation is assured. Accessibility is another feature which the Monarch company has carefully worked out in this equipment as the front of the strip can easily be taken off and the entire armature removed by simply lifting it off the bearings. It can be replaced just as easily and be depended upon to operate with its original accuracy as there is no adjustment to be disturbed. Like the Monarch drop coils, these coils are removed from the back of the shell without disturbing the working parts or interfering with the operation of the board. The perfect satisfaction given by this Monarch board is evidenced by the fact, it is said, that after it had been installed and its operation thoroughly tested, the Sioux City Telephone Company immediately ordered another board of the same type.

BAIRD SECRET SERVICE TELEPHONES.

THE Baird Manufacturing Company, Chicago, Illinois, is receiving many orders from old customers for its lock-out and selective ringing telephones, which are a most practical and satisfactory testimonial to the merits of the Baird secret service system. Owing to the simplicity of the selective mechanism in the telephone and in the operator's calling device the cost of maintenance has been made very low. The following telephone companies have lately ordered additional Baird secret service equipment: Lincoln Telephone Company, Lincoln, Nebraska; Cape Girardeau Bell

Telephone Company, Cape Girardeau, Missouri; Southeast Missouri Telephone Company, Charleston, Missouri; Home Telephone Company, Plattsburg, Ohio; Home Telephone Company, Minster, Ohio; Marion Telephone Company, Maria Stein, Ohio; Ashtabula Telephone Company, Ashtabula, Ohio; Mt. Olivet Telephone & Electric Company, Mt. Olive, Illinois; Tri-State Telephone & Telegraph Company, Osceola, Arkansas; Walworth Telephone Exchange, Walworth, Wisconsin; United Telephone Company, Bluffton, Indiana.

THE READING MOTOR-CYCLE.

THE following letter received from The Reading Standard Company, Reading, Pennsylvania, manufacturers of the Reading motor-cycle, may be of some interest to TELEPHONY readers:

"Isthmian Canal Commission,
"Washington Office, March 24, 1908.

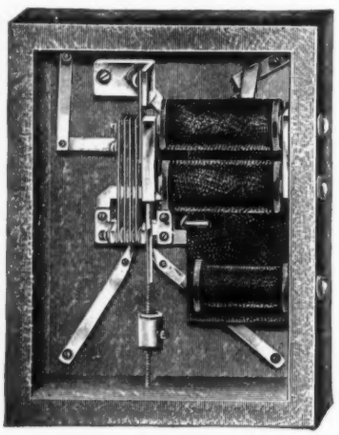
"The Reading Standard Company,
"Reading, Pennsylvania.

"Gentlemen: The model 'D' twin cylinder arrived yesterday but I did not try it until to-day. Naturally I expected a fine machine but was surprised to find that it exceeded my fondest expectations. I consider it the cream of motor-cycles, and do not doubt it will live up to it.

"Wishing you every success, I am,
"Very respectfully yours,
"THOS. O. WANSLEBER,
"728 11th street N. W., Washington, D. C."

THE CURRENT STANDARD POLE CHANGER AND DUPLEX SET.

THE Current pole changer is said to be desirable on account of its efficiency, simplicity and economy. The entire mechanism of the pole changer as herewith illustrated is built on the inside of a highly finished quarter-sawed oak case with the binding posts on the outside. To observe the interior one has simply to turn it over. It is so



Current standard pole changer.

constructed that it will work in all positions and perfectly on alternating and direct pulsating current ringing. It is inexpensive as only one battery is required of forty or fifty ordinary dry cells. The company not only guarantees absolute satisfaction to all purchasers, but guarantees immunity from patent litigation of every description. Its patents are said to be not only original but very strong and comprehensive.

The other telephone specialty manufactured by the Current Electric Company is its standard duplex set which is used extensively on metallic bridging lines, metallic toll lines, trunking lines, etc., as it renders one or more additional talking and ringing circuits, according to the original number of circuits and instruments used without cross talk or disturbance to the original lines. Detailed information concerning these two interesting specialties will, with prices and samples, be sent to those addressing the Current Electric Company, 52 State street, Chicago.

BISSELL SECURITY CABLE COMPOUND.

WITH the opening of the construction season the F. Bissell Company, Toledo, Ohio, reports a gratifying increase in the sales of its security cable compound. This, coupled with the fact that it is constantly securing new converts, easily accounts, it is claimed, for the steady increase in sales since it was brought on the market four years ago. The popularity of the security compound is due primarily, it is said, to its plasticity, neutrality and waterproof excluding qualifications. The base of Security compound is paraffine. Paraffine, as is well known, is one of the best air excluders being used by the majority of jelly canners to exclude oxygen. With it are mixed other materials to raise the melting point, bringing it to a point that will allow it to remain plastic under the extreme temperatures of summer and winter in this country. This material is absolutely neutral in its construction. Materials of either acid or alkali would have injurious effect on both wire and fabric and as neither appear in Security cable compound is one of the strongest points in its favor. As moisture must be excluded from any cable joint, the fact that the Security compound is absolutely waterproof is also of great importance. Owing to the quantities in which Security compound is handled, the F. Bissel Company is able to market it at a price, it claims, that compares favorably with that of other competitive compounds now on the market.

Bissell security cable compound.

IDEAL IRONITE DUPLEX DROP WIRE.

THE Durant Electric Supplies Company says that its Ironite ideal duplex drop wire is so good, has made such a hit and has proved so satisfactory under severe conditions of all kinds, that a great many so called imitations have appeared. However, like most imitations, they do not stand the tests imposed by wind and weather, nor do they show the same high tests of tensile strength, insulation, resistance and conductivity. Some tests of Ironite were made at Purdue University recently that showed some remarkable results and these tests, which might be considered purely technical and exceptionally creditable on account of the excellence of the samples tested, have been borne out, time and again, it is said, by exchanges who have made instrument tests and have also submitted the wire to the supreme tests of actual practice and hard usage. The Durant Electric Supplies Company will send a copy of the Purdue report and some confirming "documents in evidence" (written by the most reliable of all witnesses—the actual users) to any exchange managers who are interested in putting up drop wires that will "stay put" in rain or shine or snow or sleet. These reports go far to prove the claims of the manufacturers that Ironite is the Ideal drop wire.

To illustrate its idea of the ideal they are sending out an exceedingly artistic postal photo that will appeal strongly to any man with an eye for beauty. It's a lady, of course, and she appears to be about as ideal as Ironite is claimed to be. Both ought to make friends for the Durant Electric Supplies Company. The company says it will send a postal and a sample of Ironite to any man who is a good judge of wire and woman beautiful. Look up its advertisement and mention TELEPHONY.

The Moon Manufacturing Company, Chicago, Illinois, reports that its new porcelain and bronze terminal connection, which it is now using in its standard terminals, is meeting with considerable favor with the telephone people, and its orders for this new apparatus is very gratifying.

THE INTERNATIONAL ASSOCIATION

Recent Notices Sent Out from the Association's Headquarters, Monadnock Building, Chicago.

By A. C. Lindemuth.

THE International Independent Telephone Association announces that it will be one of the aims of the association to aid in the development of new territory, thereby extending the Independent telephone system, and incidentally increasing the market for Independent telephone apparatus and supplies. In carrying out this policy, the association will endeavor, wherever it consistently can, to put reliable investors, construction firms and engineers in touch with the opportunities to develop new territory. Any person having information of undeveloped territory, be it toll line or local exchanges, which would present attractive and practical investment, will confer a favor upon the association by forwarding such information to the headquarters in Chicago.

THE companies named below have made settlement with the association for their stamp dues for the year 1908, the same being payable monthly in advance, thus securing to the organization a regular and assured income from those companies, and thereby relieving the association and operating companies, as well as the companies named, from a considerable amount of trouble and expense incident to the plan:

American Electric Telephone Company, Chicago, Ill.
Automatic Electric Company, Chicago, Ill.
Century Telephone Construction Company, Buffalo, N. Y.
Chicago Telephone Supply Company, Elkhart, Ind.
Dean Electric Company, Elyria, Ohio.
Illinois Electric Company, Chicago, Ill.
Monarch Electric Company, Chicago, Ill.
North Electric Company, Cleveland, Ohio.
Sterling Electric Company, LaFayette, Ind.
Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y.
Swedish-American Telephone Company, Chicago, Ill.
Telephony Publishing Company, Chicago, Ill.
The Vote-Berger Company, LaCrosse, Wis.

For reasons satisfactory to the executive committee and the active officers of the association, the application of the stamp resolution adopted at the convention held in January last is waived as to the following:

John A. Roebling's Sons Company.
American Steel & Wire Company.
Standard Underground Cable Company.

The following is a list of companies who are using the stamps on their invoices:

Acme Telephone Manufacturing Company, Albin, Iowa.
American Automatic Telephone Company, Urbana, Ohio.
B-R Electric & Telephone Manufacturing Company, Kansas City, Mo.
Blackburn, George R., Cleveland, Ohio.
Cadwell Cabinet Company, Jamestown, N. Y.
Carbolineum Wood Preserving Company, Milwaukee.
Chance Manufacturing Company, The, Centralia, Mo.
Cobb, H. E., Monadnock Block, Chicago.
Conover, George, Merchants' L. & T. Building, Chicago.
Cook, Frank B., 240 West Lake street, Chicago.
Cracraft-Leich Electric Company, Genoa, Ill.
Curtis Sash & Door Company, Sioux City, Iowa.
Dearborn Electric Company, Chicago.
Durant Electric Supply Company, 56 Fifth avenue, Chicago.
Doubleday-Hill Electric Company, Pittsburg, Pa.
Ericsson Telephone Manufacturing Company, L. M., Buffalo, N. Y.
General Insulate & Machine Company, Brooklyn, N. Y.
Highland Electric Chemical Manufacturing Company, Connellsville, Pa.
Holtzer-Cabot Electric Company, The, 395 Dearborn street, Chicago.
Indiana Steel & Wire Company, Muncie, Ind.
Korsemeyer Company, Lincoln, Neb.
Long Distance Telephone Manufacturing Company, South Bend, Ind.
McCulloch & Moss Lumber Company, Minneapolis, Minn.
Metropolitan Electrical Supply Company, 184 Lake street, Chicago.
Nagel Electric Company, The W. C., Toledo, Ohio.
National Lumber & Creosoting Company, Texarkana, Ark.
National Pole Company, Escanaba, Mich.
Newgart & Co., Henry, 30 West Monroe street, Chicago.
Paducah Pole & Timber Company, Paducah, Ky.
Peirce Specialty Company, Elkhart, Ind.
Protective Electrical Supply Company, The, Fort Wayne, Ind.
Rock Island Battery Company, corner Ninth and Sycamore, Cincinnati, Ohio.
Sandwich Pole-Changer Company, Sandwich, Ill.
Simplex Electrical Company, Monadnock Block, Chicago.
Sterling & Sons Company, W. C., Monroe, Mich.
Sumter Telephone Manufacturing Company, Sumter, S. C.
Terry Company, T. B., Cedar Rapids, Iowa.
Texas Wood Preserving Company, The, Jefferson, Texas.
Torrey Cedar Company, Clintonville, Wis.
Transmitter, The, Weatherford, Texas.
Wire & Telephone Company, The, of American, Rome, N. Y.
Wood (Harry I.) Company, Louisville, Ky.

(Above list complete to April 17, 1908.)

In case of neglect on the part of any of these companies to use the stamps on their invoices, kindly remind them at once.

Copies of the trade-mark resolution and rubber stamps for marking your purchasing orders, and invoices returned for stamps, will be furnished free upon request to the Chicago headquarters.

Cut this list out and post it up on your desk. It tells who are aiding the association and the Independent cause.

The association has received information regarding a splendid opportunity for Independent development in new territory, with a chance for establishing a number of small exchanges and farm lines, and working up a lucrative toll business with only a small investment. There are already a number of well developed exchanges in surrounding territory, ready and anxious to connect. All persons making inquiry, accompanied with proper references, will receive particulars as to locality and person with whom to correspond.

The association has moved into its new quarters in the Manadnock building, Rooms 339 to 341. Independent telephone men visiting Chicago are cordially invited to call.

TELEPHONIC TRANSMISSION MEASUREMENTS

First Installment of a Paper Read Before the Institution of Electrical Engineers, in London, England

By B. S. Cohen and G. M. Shepherd

PART ONE.

THE study of telephonic transmission in a scientific manner has advanced very considerably during the last few years.

The necessity for increasing the range over which commercial speech is possible, due to the constant extension of the telephone into remote districts, and also the realization of the large expenditure involved in line construction and the consequent possibilities for economies, are undoubtedly responsible for this advance. For some time, however, the advance in transmission study has been mainly on the theoretical side, and investigators into the value of inserting inductances into telephone lines, such as Pupin, G. A. Campbell and Hayes, also Kennelly, have elaborated and put into workable form the original deductions of Oliver Heaviside on the transmission of alternating currents of variable frequency over telephone lines.

In order to apply in a practical manner the laws which govern the transmission of telephone waves, it is necessary to have fairly accurate quantitative information regarding the various factors concerned. The latest formulae for calculating attenuation take into account practically all these factors, and have been proved to give solutions of most of the transmission problems met with in practice, but

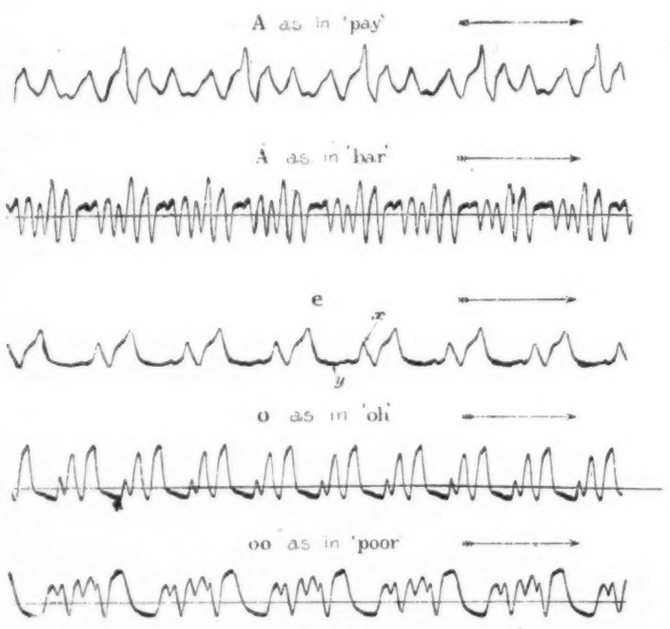


Figure 1.

unfortunately very little is known as to the value of most of these factors.

As an example, what may be called the two fundamental factors in obtaining quantitative transmission results, viz., the average and highest important frequencies to be found in telephone speech waves, have been in the past more or less guessed at, and consequently very little information exists regarding many other factors which depend on them, such as line and apparatus impedances.

The acquisition of any absolutely accurate figures is a matter of extreme difficulty, owing to the large number of variables existing, but an endeavor has been made to get data sufficiently accurate for practical application. This has been rendered possible as a result of the introduction

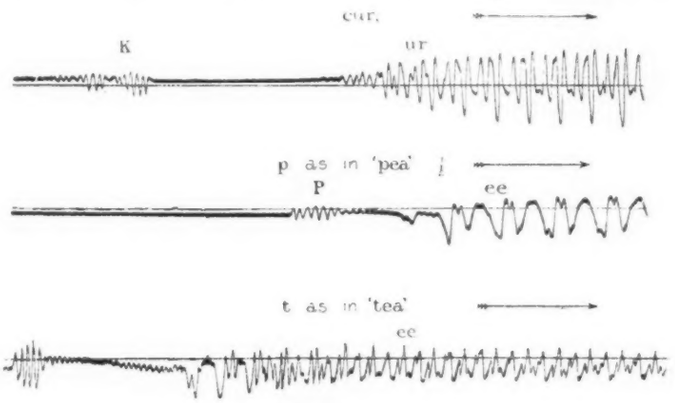


Figure 2.

of a number of instruments suitable for measuring the various attributes of telephone waves and lines.

The results described in this paper have been obtained in the investigation laboratory of the National Telephone Company, and embody methods of measuring frequency, distortion, attenuation, current and power of telephone waves, and also line and instrument impedances.

Use of Oscillograph.—As might be expected, the oscillograph has afforded a great deal of useful information with regard to telephone waves.

The instrument used is the high-frequency pattern of Duddell. This instrument has two separate vibrators which can be used in a variety of ways. For investigating the attenuation and distortion of waves over telephone lines, one can be placed at the beginning and the other at the end of the line.

Owing to the small resistance (about ten ohms) of these vibrators and their negligible inductance, they have no appreciable disturbing effect on the circuit into which they are introduced.

This oscillograph is used in conjunction with the falling photographic plate arrangement. Owing to the high frequency and general complexity of many of the telephone waves, it is very necessary that the vibrators should be working at their correct damping temperature in order to obtain reliable records. As mentioned by Duddell and others, the best test for correct damping is a square wave produced by interrupting a direct current.

Oscillograms of Speech Waves.—Figure 1 shows a number of vowel sounds as interpreted by a common battery solid-back transmitter working at normal load. These were continuously sounded into the transmitter mouthpiece.

These vowel sounds are quite characteristic, and can be picked out in many oscillograms of complete words, although

they get altered somewhat in shape by different voices. The small ripple on the flat portion of the *E* wave marked *y*, for example, is considerably amplified in some voices, and the portion *x* very often disappears completely. The main characteristics, however, remain. *E* appears to be much the simplest of all the vowel sounds.

The falling-plate camera does not lend itself so readily to

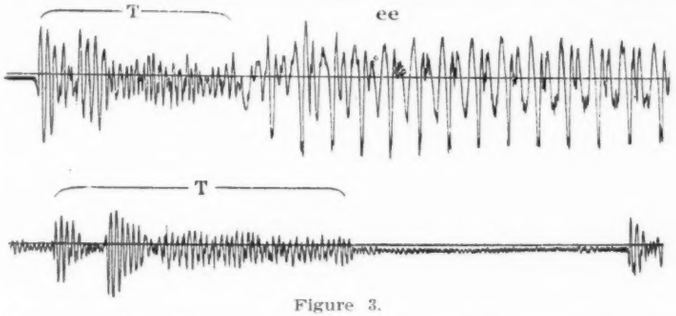


Figure 3.

the recording of consonants, but by rapidly repeating the consonant and reducing the speed of the falling plate it is possible to obtain satisfactory records.

Figure 2 shows a number of consonants and words. The beginning and end of each word is indicated. These cases ("cur," "pea," and "tea"), which have all explosive consonants, are interesting. It will be seen that the explosive portion is quite separate and distinct from the vowel portion, being, in some cases, separated by an interval of quiescence.

Figure 4.

The question arose as to why the consonant portion in these cases should be generally of smaller amplitude than the vowel portion, as in the case of the originating sound wave the ear would appear to indicate that the reverse is the case. It was thought that this might be due to the transmitter diaphragm, which in the case of the solid back is somewhat heavy and is strongly damped, and would not therefore respond to the brief consonant portion so well as to the vowel portions. In order to prove this, the same consonants were recorded, using both the solid-back and a lighter diaphragm granular transmitter.

Figure 3 shows the sound "tea" with the light diaphragm transmitter. In this case the consonant portion is nearly of

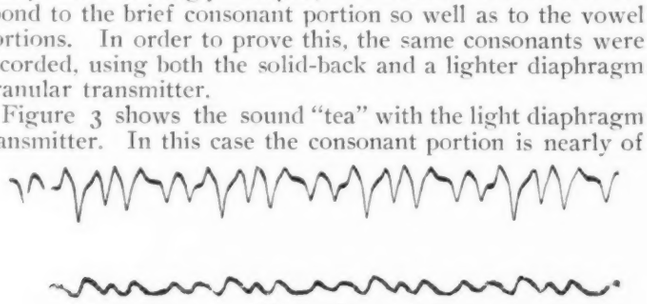


Figure 5.

the same amplitude as the vowel portion, the diaphragm is also very little damped and indicates high-frequency vibrations in the interval between the consonant and the vowel which were not shown up by the solid back. Figure 3 also shows an oscillogram of the consonant portion of "tea" taken by itself. This is clearly a reproduction of part of the preceding figure and helps to prove the accuracy of these oscillograms. It is interesting to note that the tests of the particular light diaphragm-transmitter used gave articulation superior to that of the solid back, although the former transmitter was in some ways inferior to the latter.

It may be of interest to mention that the most efficient sound from the point of view of amplitude is the "oo" vowel sound as in poor, whilst the least efficient sounds are the consonants "s" and the rolled "r"; the "r," which is of very high frequency, is depicted in Figure 4.

The oscillograph is obviously specially suited to the investigation of the attenuation and distortion of waves over telephone lines, and particularly to the latter.

Figure 5 shows the attenuation and distortion of a complex sound wave (singing "la") over a sixteen-mile cable line. The cable in this case was equivalent to one with 17.6 miles of 20-lb. conductors, and the transmission over this length of line is very good indeed.

On analyzing the received wave it is found that everything above the seventh harmonic seems to have practically

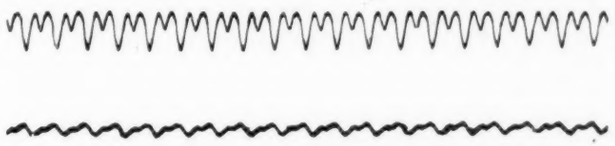


Figure 6.

been wiped out, and this harmonic represents a frequency of 980 ∼.

Figure 6 shows a note sung by a girl in a high tone, which was taken as representing the upper limit for speech frequency. The line in this case was 16.6 miles of 20 lbs. On

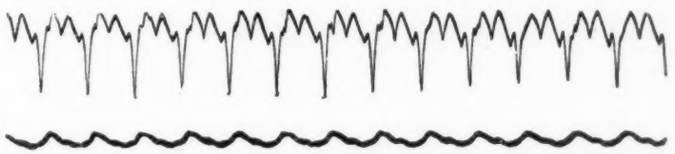


Figure 7.

analyzing these curves the highest frequency left prominent in the received waves was 3,000∼. This is a very high figure, and does not necessarily represent a frequency that matters, firstly, because the fundamental was exceptionally high, and, secondly, because the speech limit is not reached until about 50 miles of 20-lb. cable is in circuit; unfortu-

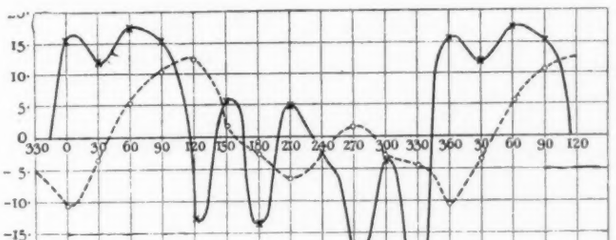


Figure 8.

nately we have not found it possible to obtain an analyzable record over this mileage with the oscillograph.

The analysis of the two waves in Figure 5 brings to light the fact that the attenuation of the current behaves in a curiously fluctuating manner as the frequency increases. The following table gives percentages of received currents for the various harmonics:

Harmonic.	Percentage received.	Harmonic.	Percentage received.
1 (Fundamental)	81·0	9	25·0
2	47·0	10	25·0
3	57·0	11	81·0
4	46·0	12	13·0
5	41·5	13	2·5
6	28·0	14	15·5
7	25·0	15	4·0
8	30·0		

The big rise at the eleventh harmonic is very noticeable.

A further example of this effect is apparent in the waveforms of Figure 7, which represents a singing "oo" sound on thirty miles of cable.

Analysis up to the eleventh harmonic shows the following percentages received:

Harmonic.	Percentage received.	Harmonic.	Percentage received.
1	34·3	7	6·3
2	16·7	8	1·5
3	6·0	9	33·0
4	5·0	10	16·4
5	1·0	11	8·2
6	7·3		

The ninth harmonic is the notable one in this case, and would have a frequency of about 2,295 ∼. Such analyses as the above are, of course, somewhat rough affairs, owing to the difficulty in obtaining clearly defined enlargements of attenuated wave negatives; it is also an extremely laborious business.

The absence, unfortunately, of any precise data regarding the terminal condition of the circuit when these oscillograms were taken, renders it impossible to explain the phenomena theoretically. That such an occurrence is in some degree possible, however, may be demonstrated by taking an arbi-

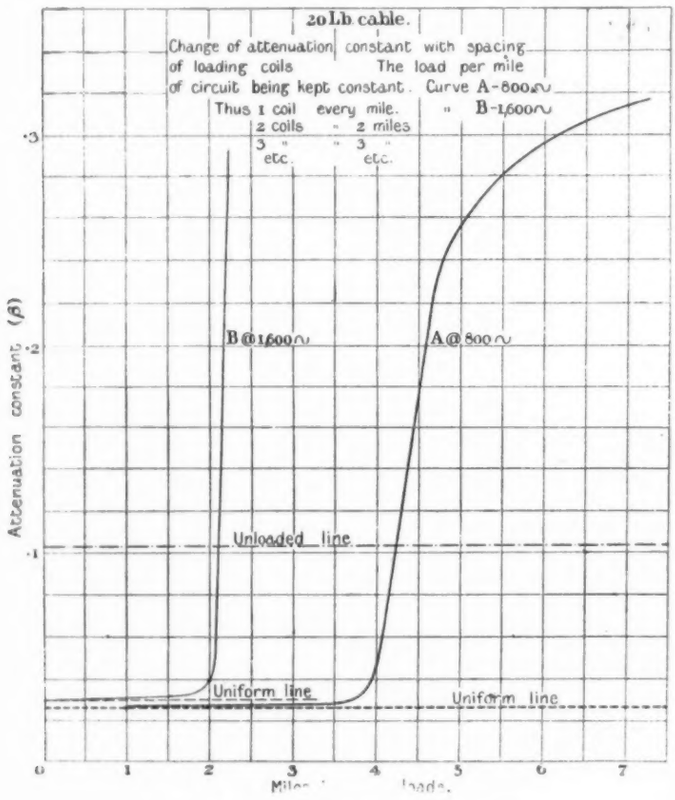


Figure 9.

trary complex electro motive force, and supposing this to be impressed upon a circuit of known electrical constants. Thus, let the following:

$E = 100 \sin pt + 75 \sin (2pt - 45) + 50 \sin (5pt + 30)$, with a fundamental of 200 ∼, be the actual potential difference at the sending end of a cable line whose data are:

Length, 15 miles. Capacity, 0.054 microfarads per mile. Resistance, 85 ohms per mile. Inductance, 0. And which is terminated by a piece of apparatus, such as a telephone instrument of, say, 0.18 henry and 200 ohms.

Figure 8 shows the above function plotted out through a complete period, both for the beginning and end of the circuit. In this theoretical example the percentages of received current for the three harmonics present are respectively: First, 57.4 per cent; second, 71.5 per cent, and third, 14.4 per cent.

Oliver Heaviside deals with this matter at some length

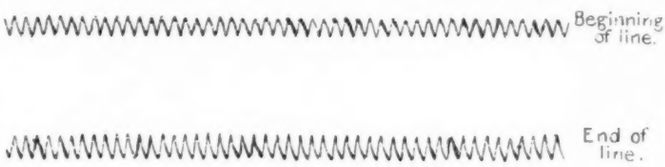


Figure 10.

in his collected papers, Volume II., and shows by means of the equation for the receiving end impedance, that the latter passes through successive maxima and minima values with increasing frequency. These fluctuations become less and less marked, and finally disappear at high frequencies. What precisely the practical effect on transmission is of this special reinforcement and diminution of certain tones we cannot at present say. The causes tending towards distortion are so many and varied that perhaps the resultant effect is not so strongly felt as might otherwise be the case. At all events, Heaviside's remarks regarding the instinctive quality of the human ear for recognizing what must in reality be the merest phantoms of speech vibrations, appear to be pretty well borne out in practice. Volume is the prime necessity; articulation, is, comparatively speaking, of sec-

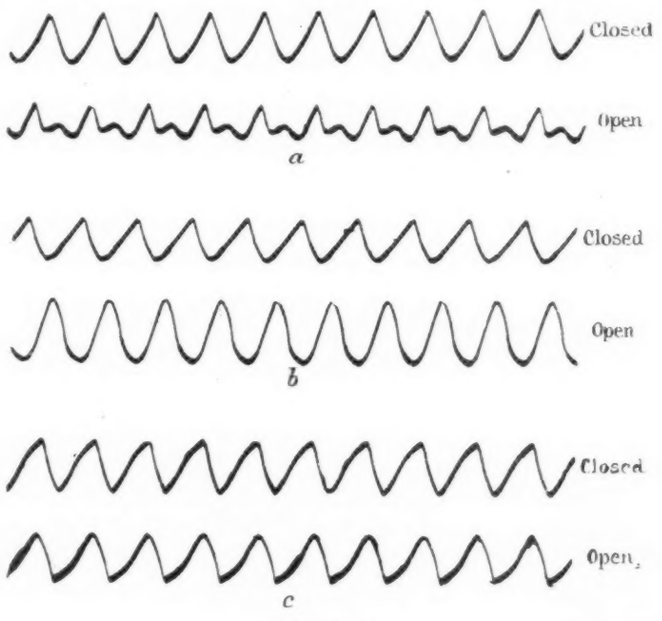


Figure 11.

ondary importance. The subject of line resonance (if that term may be applied) seems, however, to be one worthy of closer investigation.

As previously mentioned, figures for the highest frequency met with in speech waves, which must be retained in order to obtain intelligible speech, are of great importance, and although the oscillograph may help to obtain some idea on this subject, this method is necessarily exceedingly complex and laborious, and involves the likelihood of considerable error, although it must be borne in mind that any absolute figures are out of the question, as the point at which articulation becomes so bad as to render the speech

unintelligible involves the personal equation to a considerable extent.

Some tests carried out on loaded lines led to an interesting method of ascertaining the highest important frequency in articulate speech. If the spacing—i. e., distance apart—of loading coils is increased, and at the same time the amount of inductance per mile inserted is unchanged, the attenuation constant also increases gradually, and at one particular spacing increases to an enormous extent.

Figure 9 shows curves for the variation of attenuation constant with spacing for frequencies of 80 and 1,600 ∼. These curves were calculated from formulæ by G. A. Campbell and have been confirmed by tests made with a sine-wave alternator.

As the articulation of a received telephone wave depends to a very great extent on the attenuation of the harmonics present, it was thought that the application of the arrangement just referred to would help to settle the question as to which frequencies determine by their presence or absence the difference between articulate and inarticulate transmission.

A series of articulation observations were consequently made on 20 miles of cable for increasing spacing intervals with a constant load of 0.17 henry per circuit mile and commencing with a distribution of 1 load per mile.

It was found that a 2-mile load was very slightly inferior to the unloaded line of equivalent speaking volume, but still gave excellent commercial transmission. This indicates that harmonics above 1,600 ∼ may be dispensed with (see Figure 9).

With 3-mile distribution the articulation was commercial but decidedly inferior to the unloaded line. The critical frequency for this disposition of the load was about 1,100 ∼ and it is thus apparent that harmonics between 1,100 ∼ and 1,600 ∼ are valuable.

For 4-mile intervals speech became quite impossible, although the volume was still quite considerable, and we must therefore conclude that the highest indispensable frequency lies between 800 and 1,100 ∼ and also that it is desirable to retain something higher than 1,100 ∼ for really high-grade transmission. Probably 1,500 ∼ would be quite a satisfactory figure to base calculations on.

Pupin and other writers use 750 to 800 ∼ for many transmission calculations. It is important to note that this represents a fair average frequency, as damping constants calculated with this value can be obtained experimentally when using actual speech waves.

On short cable lines, and, provided that some amount of terminal impedance exists at both ends of the line, the relationship between the sent and received currents is somewhat peculiar. Figure 10 shows the wave at the beginning and end of a line equivalent to 2.2 miles of 20-lb. cable, and in this case the receiving end wave is of considerably greater amplitude than the wave at the transmitting end.

The wave in this case was produced by whistling into the transmitter. The effect is considered further on in connection with telephone current measurements.

Effects Produced by Opening and Closing Receiving Ends of the Line.—Figure 11a shows the effect on the transmitted wave when opening and closing the receiving end of a line consisting of 2 miles of 20-lb. cable. With this short line the cable current passing from the *A* to the *B* wires, by virtue of their mutual capacity, is smaller than the total current flowing when the far end is closed. The variation in wave-form is also very noticeable. When, however, the line is 7.5 miles of the same cable, the current is actually greater when the far end is open than when it is closed (see Figure 11b). Lastly, when the line gets beyond a certain length, the effect on the amplitude at the transmitting end by opening and closing the receiving end is negligible.

Figure 11c shows the effect with 20 miles of 20-lb. cable.

These phenomena, which are dealt with further in another part of this paper, are due to the action of the terminal impedance, and may prove of considerable importance to the telephone engineer, as they can be varied to a great extent by varying the impedances of the terminal apparatus. With long lines, the tendency is for the impedance at the sending end to become a constant quantity, not varying appreciably with the length, and the reaction of the terminal apparatus becomes evident only to a very small degree at the sending end. (To be continued).

THOMAS A. EDISON

Some Interesting Reminiscences of the Great Inventor from Popular Electricity.

By James Walsh.

I WAS an operator at Beebe's Corner, later Ridgeway and now Lennox, when I first met young Edison; he was then about 13 years of age. Beebe's Corner was a station between Detroit and Port Huron, and the boy carried newspapers on the train between Detroit and Port Huron. He left Detroit about 7 o'clock in the morning, returning about the same time in the evening. His parents at that time resided at Port Huron. This was in 1860.

We called him "little Al," and bright and well liked he was, both by train men and passengers. People have sometimes spoken of him in later life as not being a good business man—let me say that he began as one and has been one ever since. When he was newsboy on the train, he had a little font of type in the baggage car and used to print a little paper of his own, giving the news of his route as he went along between the stations, which he used to sell with the Detroit papers. This was enterprise indeed, and with it he had business sagacity, for he telegraphed the headlines of the city papers ahead to all the operators on the line, and in this way excited interest in his papers at the different stations along the line. The telegraph operators, who were all his friends, used to bulletin the headlines for him, and as it was about the opening of the war, there was always an eager waiting throng to whom he quickly disposed of his papers. He was a most lovable little fellow and a prime favorite with everybody. We all called him "Little Al."

I saw him every day during six or seven months and then was transferred to St. Marys. Meantime the lad Edison had learned telegraphy in the Detroit and Port Huron offices of the Grand Trunk. When next I heard of him he had become night operator at Stratford.

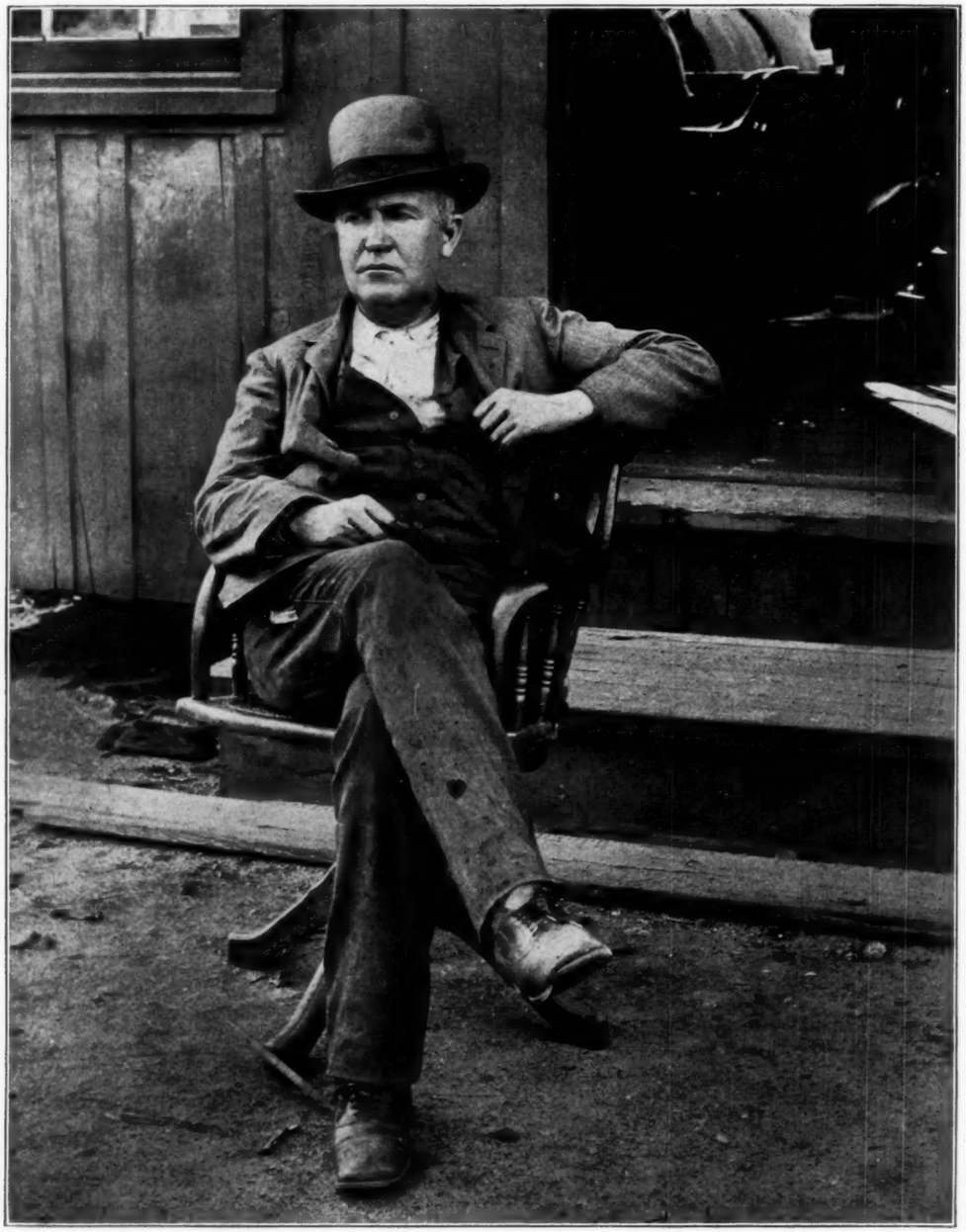
A funny incident happened there which was told to me by the superintendent of telegraph lines just as it occurred. Edison had, as night operator, to report every half hour to

the chief dispatcher at Toronto. One night the circuit was found to be open somewhere between Toronto and Stratford. It happened as luck would have it that the superintendent of telegraph lines was on the night train leaving Toronto, and he tested all the offices along the line to find the break. When he reached the Stratford office he found the trouble was right there, and on examining the connections he found that young Edison was the cause of it by reason of an electric alarm clock he had invented to wake him up at the half-hour periods, so that he might hear the call if he drowsed off, as night operators sometimes do. The alarm did not waken him on that particular night and the result was that Edison got the "sack" there and then.

Next day he went to Buffalo, the terminus of the Stratford line, and obtained employment in the Western Union Company's office. The manager there thought he had a greenhorn to try out, and put him on the Associated Press wire the first night, giving word to New York to rush business for the benefit of the new man. But the new man took the business all right, swift though it came, to the intense surprise of the local manager and the sender in New York. Thus was Edison's reputation as a crack operator established at once. It was born in him.

The next I heard of him was after his success in inventing the stock ticker. This instrument is substantially the same to-day as when he first invented it. With part of the proceeds of that invention he purchased the street railway line between Fort Gratiot and Port Huron for his father and brother and set them up in business. Afterwards his reputation became world wide.

I have always been proud of my early acquaintance with "Little Al," and proud, too, of his grand success.



A characteristic pose of Thomas A. Edison in his working clothes.

A young lady in Winchester, Ky., recently became the blushing bride of a gentleman in Hampton, Va., the services being conducted by long distance telephone. The groom was 400 miles from his bride and the clergyman.

Telephone subscribers in Peking, China, are said to number about 1,700, with over a hundred on the waiting list.

WIRELESS TELEPHONY FOR THE NAVY

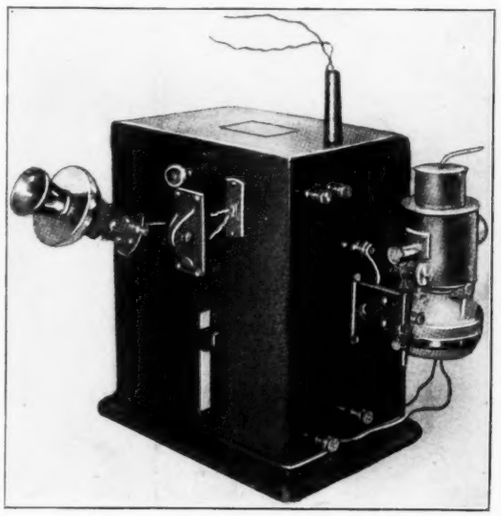
A Description from the Scientific American of the Radio Apparatus

By Herbert T. Wade

FMOST essential condition of modern warfare is to maintain unbroken and complete communication along the entire line, from the commander-in-chief and the board of strategy to "the man behind the gun." Every device in the way of a signal or telegraph that accomplishes this purpose must be employed, and new inventions are warmly welcomed, especially in the naval service, where to secure the best results a fleet must move at the direction of one man, and often as a single unit. Accordingly, when it was anounced recently that wireless telephony had been developed to a practical state, it was but natural that the United States navy should wish early to test its claims, with a view to its extensive adoption for intership communication, as well as for talking between sea and shore or between temporary or isolated stations, as on islands. For such tests apparatus has recently been installed on the United States battleships Connecticut and Virginia by the Radio Telephone Company under the direction of Dr. Lee De Forest, who for several years has been devoting himself to the transmission of articulate sounds by electrical waves, and has developed his apparatus so that the practicability of wireless telephony on a commercial scale seems assured. If the report of the naval officers supervising these tests is satisfactory, it is quite probable that the new Pacific fleet, at least, will be completely equipped with apparatus for wireless telephony.

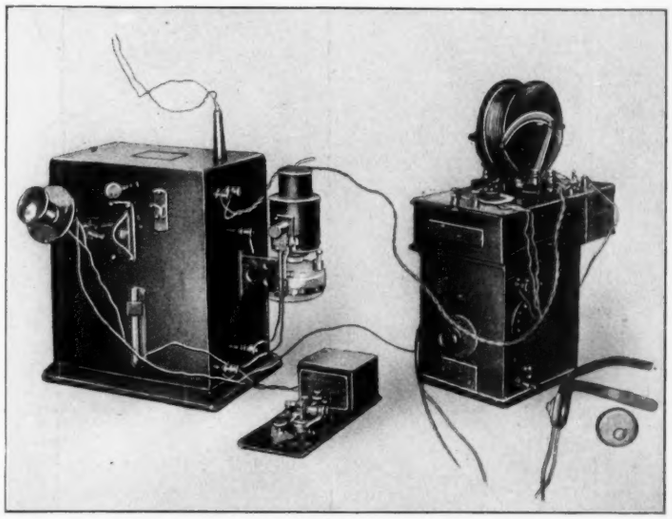
The present application and tests involve the installation

The Audion.



The Radio telephone transmitter.

of transmitting and receiving apparatus in the wheel house or on the bridge of the battle ships, working in connection with, yet quite independent of the ship's ordinary wireless telegraph equipment. This enables the admiral or captain to converse with any ship within five miles, the contract limits of the present installation. The apparatus as now constructed is the result of an exhaustive series of laboratory experiments by Dr. De Forest, combined with practical tests made last July on Lake Erie, when wireless telephony was used in reporting a yacht race to communicate between a small yacht in motion and the shore. On this occasion it was shown publicly that for distances up to four miles, satisfactory telephonic communication without wires is perfectly feasible, and it is with an improved form of this apparatus that tests are being made by the navy. Just previous to shipment to Provincetown for installation on the battleships, and while undergoing the final laboratory



Complete equipment of transmitting and receiving instrument for one station.

testing, the instruments were specially photographed for the Scientific American, and are shown in the accompanying illustrations.

In explaining the construction and operation of the De Forest system, it may be desirable to say a few words as to the underlying theory. Wireless telephony, as also wireless telegraphy, depends upon the production of electric waves that pass through the atmosphere, and also solid substances, with a velocity equaling that of light—186,000 miles per second.

In order to transmit either telegraphic signals or vibrations corresponding to those of the voice, it is necessary to interrupt or vary these waves at intervals depending on the signals or character of the sound. The production and transmission of the waves is essentially the same in wireless telephony as in wireless telegraphy, but their interruption is an entirely different matter. The vibrations corresponding to the human voice have an average rate of about 500 per second, for a man's voice, extending up to 20,000 per second for the overtones, while in wireless telegraphy, manually operated, it is possible to work at a rate of about five interruptions per second, the telegraph signals of course corresponding to the familiar Morse alphabet. In wireless telegraphy the receiving of the waves is accomplished by any one of a number of devices, such as the coherer, the magnetic detector, electrolytic responder, etc., but in wireless telephony there is need of a specially sensitive device, and this is realized in the audion, which, devised by Dr. De Forest and adapted for both space telegraphy and telephony, has been found a specially valuable element in

the latter. This instrument, shown in the illustration, appears at first glance to be simply a small incandescent lamp, but there will be noticed a plate and a grid of platinum sealed into the bulb and connected with the exterior by platinum wires. The filament is of tantalum or other metal and is made to glow by a current from a small storage battery. The action will be explained below more fully in connection with the rest of the apparatus whose connections and arrangement are indicated on the accompanying diagrams. At the transmitting instrument current is supplied at 220 volts from the ship's lighting mains or other supply such as a small dynamo driven by an oil engine or a

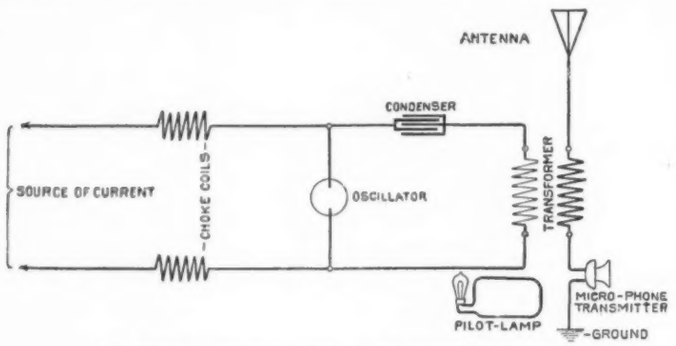


Diagram of Radio telephony transmitting station.

dynamotor using current at a different voltage. This direct current flows through choke coils which prevent the high-frequency alternating current from passing, and then goes to the oscillator, which consists of an arc maintained in the flame of a small alcohol lamp. The production of high-frequency alternations from an arc was first discovered by Duddell in England and has been investigated by several physicists and experimenters, so that it was comparatively easy for Dr. De Forest to adapt the principle to his transmitting apparatus, although the actual application and the construction of a practical device required most elaborate and careful experiment. These currents with a frequency of about 40,000 per second pass through the primary of the transformer as indicated, a condenser being interposed in the circuit. The secondary of the transformer is connected with the antenna or aerial wire of the usual type used in wireless telegraphy, and to the ground through the microphone of an ordinary telephone transmitter. By adjusting properly the two circuits it is possible to produce in the aerial wire oscillations that will cause waves of the desired frequency to be sent out into the air. Now the vibrations of the voice acting on the microphone cause the resistance of the carbon granules to vary, consequently the resistance of the aerial wire circuit varies, and this correspondingly affects the amplitude or intensity of the waves emitted from the antenna, not cutting them off absolutely as in wireless telegraphy. Examining now the diagram for the receiving instrument, a similar aerial wire will be seen connected to the earth through one coil of a transformer, while the circuit of the secondary includes two condensers, the audion with its storage battery, and the telephone with its cells. The electric waves impinging on the aerial wire set up a series of oscillations, which in turn are reproduced in the corresponding circuit of the transformer and affect the audion, causing the resistance of the gas ionized by the heat of the glowing filament to vary in proportion to the amplitude of the oscillations in the aerial wire, and the diaphragm of an ordinary telephone receiver is made to vibrate in the usual manner, reproducing the sound spoken into the transmitter.

The conditions outlined above and explained by the diagrams are realized in the instruments themselves, shown in the illustrations. Here everything is brought together and the adjustments reduced to a minimum, so that by observing a few simple rules there is no need for a trained operator. The illustration shows the complete apparatus for a single station, with the appropriate connections and all adjuncts except the batteries and aerial wires. It will be noticed that the apparatus is simple and compact, occupying little more space than the familiar wall set of the ordinary telephone. The transmitting instrument on the left will be recognized from the familiar microphone transmitter, while the instrument is shown again by itself somewhat enlarged. The conductor leading to the aerial wire passes out at the top of the case and the source of current is connected with binding posts at the rear. At the side of the box is the oscillator or arc inclosed in its nickeled casing with the alcohol lamp beneath. This lamp is lighted and the transformer coils contained in the case are adjusted so that oscillations of the proper frequency are produced and waves of the desired length are emitted from the aerial wire. The action of the arc is indicated by the small incandescent "pilot" lamp shown at the top of the box, which is acted on inductively by the current in the primary of the transformer and glows when the oscillation takes place. The tuning of the transmitting circuit is accomplished with the small handle moving in the slot at the side of the box, while a listening key is provided to enable the operator to connect at will the aerial to either transmitting or receiving instrument. There is also a telegraph key and a device resembling the ordinary buzzer which is termed a "chopper" by Dr. De Forest, shown in the foreground of the illustration, which by simply cutting out the microphone with a switch in front of its case, enables the apparatus to be used for wireless telegraphy, sending the ordinary Morse signals. In telephoning, the method is to send a few such signals to attract attention and then to switch onto the microphone or talking circuit. The receiving instrument is contained in the two boxes shown at the right of the illustration. On the upper box is the two "pan-cake" syntonizer or tuning device consisting of two coils where the number of turns can be varied at will, and beneath an adjustable condenser and impedance coils, the whole being tuned of course to the sending apparatus.

The lower box, from which leads pass to the telephone receiver, contains the audion, already described and illustrated, which is provided in duplicate in case of possible mishap, together with suitable switches and resistances to enable the current from the storage battery for the lamp

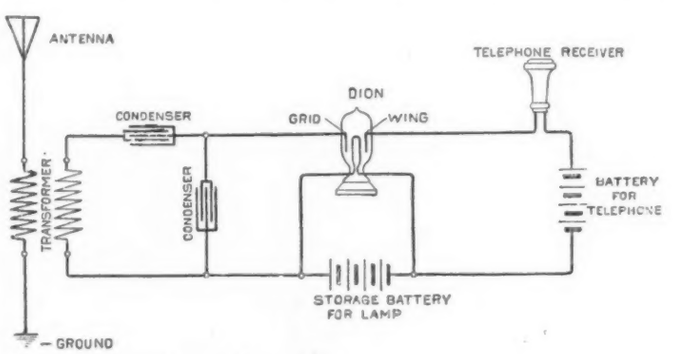


Diagram of Radio telephony receiving station.

circuit and that from the dry cells for the telephone circuit to be regulated and used most effectively. The speaker has merely to put the telephone to his ear, using the listening key, and to talk into the transmitter. The simplicity of the apparatus commends it for naval use, as it enables communication to be maintained not only between the vessels of a fleet but with torpedo boats or dispatch boats on detached service in maneuvers or in action. Furthermore, there is a field for use in communicating with colliers and supply boats, not to mention lightships, lighthouses and shore stations generally. With the improvement and increase in the range of action which is bound to follow now that a prac-

tical success has been assured, the usefulness of wireless telephony at sea will be widely extended. As a fog signal and means of communication in thick weather, it promises to increase the safety of ocean travel. Wireless telephony has also important applications on land which are attracting the attention of the inventor, but the apparatus above described is of special interest as being the first to be installed on United States naval vessels.

THEODORE GARY'S BOOK.

ONE of the most complete books dealing with the Independent telephone movement ever published is the one recently issued by Theodore Gary, of Macon, Mo., former president of the International Independent Telephone Association and one of the most prominent operators in the field. Mr. Gary's book is appropriately entitled "Independent Telephony," and is an eloquent advocate of the magnitude, stability, methods, finances and securities of the Independent telephone companies of the United States. Mr. Gary, the author, devoted a great deal of time and energy to the preparation of a work that would give an adequate idea of the scope and achievements of the Independent movement, and his efforts have been eminently successful. His book tells the wonderful story of the telephone in an effective manner, and shows the mighty industry and its development in all its various stages.

Interesting engravings of leading men in the operating and manufacturing field, their exchanges and factories are found throughout the volume. The growth of Independent companies constitutes one of the most interesting chapters in the book. Another chapter is devoted to the value of public utility franchises. Mr. Gary has a well-earned reputation as a successful operator and he gives examples of his methods which contain indirect useful information. Other chapters are "Why Independent Telephone Securities are Good Investments," "New and Better Method of Telephone Finance," "Competition and Duplication of Telephones," "How to Judge Telephone Securities," and "A Better Understanding."

Mr. Gary's book cannot help doing a vast amount of good to the entire Independent telephone movement.

THIRD NEBRASKA DISTRICT MEETING.

A MEETING of the Third District of the Nebraska Independent Telephone Association was held at Norfolk, April 17. The president, C. J. Garlow, read the following address:

"It is customary at the opening of all business meetings involving legislation for the presiding officer to submit his recommendations, suggestions, and comments, commonly called a message. In the present case your officer can suggest little more, if anything, than has been heretofore discussed or at least thought of. We fully realize that no business has ever grown as rapidly as the Independent telephone business all over the country. It is little less than marvelous when we see the investment of the millions of dollars in a business so poorly managed, yet returning so great benefit and profit. Could we have seen even three years ahead, we could have saved thousands in expenditure, and much in efficiency, but those now embarking in the business should profit by the mistakes of the pioneers. It is too true that even now men without knowledge or experience enter the business solely upon self-reliance and must pay the penalty of their folly in the future.

"Self-reliance is a grand trait in the human make-up, but entering the field of electricity and harnessing its great unknown source, power and possibilities is worthy of more than the mere expenditure of one's own knowledge and a reliance thereon. Men learn by the mistakes they and others make, and profit by intercourse with those learned and experienced in all lines of business. There is one thing we all know, who pause to think: that men of honesty and energy constantly seek to better their own condition and to do this requires adherence to certain economic principles. By economy we do not mean 'penny wise and pound foolish.'

"The telephone business is not one of charity and he who opens his lines to the world under the guise of being a 'good fellow' and charitable, will to-morrow find himself in poverty. The little line that starts as a family or neighborhood accommodation soon outgrows its dress, and must take a place in the business world and play the game that has made every business succeed and survive, or keep on its little dress and expose the delicate structure which growth has rendered inadequate. Those who would be men among us, must put on full grown clothing; those who would be charitable must produce the means by which charity may be truly bestowed; those who put money into this business or ask others must, if they wish to hold the confidence of their partners and brethren, conduct themselves and their business along lines pursued by the majority. Our country and towns are made up of men who are anxious to have the best of everything in the way of convenience, and if properly informed, are willing to pay a reasonable price therefor. This is a grand and rich country and worthy of propagating the best of everything, and it is simply up to us all to become better informed and teach those less so.

"There are but three great maxims of the law—live honestly, hurt no person and render to every one his just dues. From these maxims are deducted the great body of the law and from the foregoing suggestions we deduct the following as applicable to our business, which I trust may be discussed at this meeting and that we may all profit thereby. 1. How shall the companies deal with each other in the matter of business relations generally? 2. How shall we conduct our own business relative to the use of our lines? 3. Shall we use our means and that of our friends and neighbors, as well as our energies, so as to give a fair return from the investment, whether large or small, or shall we play the 'good fellow' while we may hold office, and let the evils of poor management drop onto the head of our successors? 4. Shall we strive to give good service at reasonable cost, or shall we advertise cheap service which must mean poor service? 5. Shall we push the toll business, the cream of our investment, or be content to see our competitor skim the cream off and leave the 'blue jack' for the Independents?

"It is up to us to answer the foregoing questions and I trust you will fully and freely discuss each phase of the suggestions, and in conclusion let me beg of every company and every stockholder to constantly bear in mind that our success lies in the strength of our united efforts. Above all things, let us stand as a Gibraltar against any and all attacks by our great competitor. Don't waste ammunition on it, but strengthen yourselves, and ever look for our weak places and strengthen them."

The officers elected for the ensuing year were W. J. Stadelman, president; W. B. Fuerst, vice-president, and T. J. Cottingham, secretary and treasurer.

NEW MEXICAN ENTERPRISE.

THE following details of the first concession for wireless and long-distance telephone service in Mexico, forwarded by Special Agent A. B. Butman, are from the Mexican Herald of recent date:

"The company, which is being formed with a capital of $1,000,000 Mexican currency ($500,000 American) to develop long-distance and wireless telephony between Mexico City and the port of Vera Cruz, is now being completed. The company is being organized through the efforts of Francisco Alfaro, who represents capitalists of London who are anxious to further the development of such an enterprise. The concession for the establishing of long-distance as well as wireless stations in the section of the republic between this capital and Vera Cruz has been obtained by Manuel S. de Corbera and Engineer J. Sitzenstatter covering a period of fifty years and including the building of lines in and between various towns, such as Vera Cruz, Cordoba and Orizaba. In these towns underground cables and lines will be laid, over five kilometers (kilometer, .62 mile) of underground work having been laid already in the port of Vera Cruz. The wireless part of the concession will be developed later, the concessionaires now putting their attention to the stringing of wires between towns and the laying of underground cables in Vera Cruz. It is the ultimate intention to spread a network of wires throughout the state of Vera Cruz for the purpose of connecting the large rubber, coffee, sugar and other plantations of that state with their center, their commercial district, Vera Cruz. Governor Teodoro A. Dehesa and his secretary of state, Eliezer Espinosa, are very greatly interested in the construction of adequate telephonic service as planned by the concessionaires, and the president of Mexico, General Porfirio Diaz, is assisting this important enterprise with many suggestions."

Telephonic Reminiscences

By C.E.McCluer

I PRESUME it must have been my unfortunate controversy with Mr. Ormes, and my still more unfortunate victory over him, that first discredited me with the Bell telephone people. I don't think they fancied or relished the fact that the Western Union under my local manipulation had beaten them in a fair stand up fight for supremacy at Lynchburg, and when they obtained the power under the terms of the famous contract with the Western Union, to assert their predominance and turn the tables on me, they gladly and cheerfully availed themselves of the opportunity. It is only surmise on my part, but I have no doubt that Ormes had reported all the circumstances of our warfare at Lynchburg, and my playful but sarcastic criticisms of the Bell-Blake apparatus, which probably lost nothing by the recital, and the patentees, the newly fledged electricians of the experimental department, and the officers of the line and staff generally, derived much pleasure from the contemplation of my surprise and chagrin at the substitution of their derided and defeated apparatus in place of the victorious Edison-Phelps instruments, which from that time forward were consigned to the scrap heap or the flames as rapidly as they came into the possession of the Bell representatives and could be replaced by the output of their own shops. But for the long continued dominance of the Western Union in the councils of the Southern Bell, I would doubtless have felt the heavy hand of the Bell authorities much sooner than I did. Being a Western Union adherent, and Western Union interests being paramount in the Southern Bell councils, I was enabled to maintain my connection with that corporation for many years with the reasonable conviction that my services were appreciated and valued at their true worth. But my adversely critical friends and antagonists at Boston merely bided their time, doubtless solacing themselves with the reflection that "all things come to him who waits."

During the intervening years I labored to the best of my ability for the advancement of telephone interests generally and those of the Southern Bell in particular, confident in the assurance that I was earning for myself a good reputation as a telephone manager, and substantial promotion in my chosen avocation, which I felt would come in good time. But alas! I did not anticipate that the capitalists of the Western Union company would ever let go their control of the Southern Bell company, and I felt confident that as long as their proprietary interests existed my future was assured. When the Bell people came into control, I think I was in good favor with the Western Union managers, and had not the Gould interests been induced to sell out, I would doubtless have retained my connection with the Southern Bell until the present time. Instead, I am ostensibly a victim of the Oslerian theory that a man should be chloroformed and quietly put out of the way on reaching the active age limit of two score years, but in reality, the innocent object of spiteful animosity on account of my lack of politic subserviency, and the possession of a superfluity of personal independence. To which may be added the attempted personal exploitation of my patented improvements in telephone methods and apparatus which chanced not to chime in with the views and desires of the Bell magnates, and you have in a nut shell the causes of my telephonic downfall. But more of that hereafter.

I filled the dual position of manager of the Western Union telegraph office and manager of the telephone exchange for a couple of years, building the exchange up during that interim from the original twenty or thirty stations to over a hundred, and rounding out a fifteen years' residence in the Hill city. Up to twelve months before promotion came to me, I had been laboring and looking, and hoping for it, but after fourteen years spent in one position, I settled down to the conviction that the coveted promotion was never coming my way, and that I had about reached the highest business altitude that Dame Fortune had in store for me.

So I bought a little home for my family and settled down to a life-long residence in old Lynchburg. We had just gotten comfortably housed in our new and as I considered it, our permanent home, when to my surprise and somewhat temporary disgruntlement, I received from Superintendent Kates, who was then acting as Western Union telephone superintendent as well as telegraph superintendent, the offer of the position of assistant telephone district superintendent and manager of the Richmond exchange. I hesitated about accepting the position, as it meant the abandonment of our home, to which we had become attached, and the sundering ties that a fifteen years' residence in Lynchburg had entwined about our hearts. But I ran down to Richmond to see and talk with Mr. Kates about it, and to survey the ground, and the result of my visit and a conference with my wife on my return to Lynchburg was, that on October 1, 1880, I reported for duty in connection with my new post at Richmond. I was immediately installed, and from that time till June 1, 1898, a period of nearly eighteen years, I never knew what it was to be idle, or to be able to fold my hands with the genuine contentment and satisfaction of knowing that my work was completed up to date.

On my assumption of the duties of manager of the Richmond exchange I found a poorly and hastily constructed house-top plant with some two hundred subscribers' stations equipped with Phelps and Williams magnetos, Blake transmitters and Phelps receivers, while the central office was supplied with a crudely constructed magneto switchboard of huge dimensions, presided over by a quartette of youths, whose sole duty it was to plug calling subscribers' wires onto one of a dozen tables located on the opposite side of the room, at which were sitting an equal number of other young gentlemen who answered the calls through the telephones with which each table was equipped. Ascertaining the station or party with whom the caller desired to communicate they would advise the operator at the board, who would connect on the line of the station wanted. The table operator would then ring up the station asked for, supervise the connection, and notify the board operator when to disconnect. Considering the character of the plant and equipment, the service was fairly good from the standpoint of the telephonist, but not at all so from the point of observation of the subscriber.

The Southern Bell Telephone and Telegraph Company whom I was then serving, had been formally organized soon after the execution of the famous contract between the Western Union and the American Bell companies, and

the former corporation was allowed to retain a controlling interest which they continued to exercise for about sixteen years. The new company was duly licensed by the American Bell to exploit the seven southern states, Virginia, West Virginia, North and South Carolina, Georgia, Alabama and Florida, which territory the American Bell had experienced difficulty in disposing of before. It is true that J. E. Hudson, the president of the parent company, was elected also to the presidency of the Southern Bell, but James Merrihew, the vice president, was the chief executive officer, with whom Mr. Hudson rarely ever interfered, if at all, and he with a majority of Western Union officers and adherents on the board of directors dominated the policy of the company for many years, until by the terms of the license contract and the act of the Western Union capitalists, the American Bell came into exclusive and unquestioned control. Mr. Merrihew was also the general superintendent of the great southern division of the Western Union, and the treasurer of the same organization, Mr. Rochester, was also the treasurer of the Southern Bell. The general superintendent, my immediate superior, was D. I. Carson who had been associated with Mr. Ormes in the original but unsuccessful attempt of the American Bell to exploit the southern states. Owing to the controlling influence of the Western Union in the councils of the Southern Bell, Mr. Kates and other telegraph superintendents were at first placed in charge of telephone interests, but later, when it became impossible for one man to perform satisfactorily the duties of the dual positions, the territory was divided into three telephone districts, and J. D. Easterlin of Charleston, S. C., J. W. Cole, of Atlanta, Ga., and myself, all old telegraph men, were placed in charge as district superintendents, and the telegraph superintendents relieved from any further responsibility in connection with the telephone department. For a long time it was the policy of the Western Union officials to place telegraph managers at the head of the telephone exchanges as they were inaugurated, just as I had been given the managership of the Lynchburg exchange. In this way many telegraphers in the south found their way into the telephone ranks, and some of them are still connected with the Southern Bell, and in positions of trust and responsibility, but others like myself, were gradually driven into other fields of usefulness after the accession to power of the American Bell officials.

Just before my transfer to Richmond, the Western Union people had purchased from the owners of the "Law system" patent the right to use that device in the territory of the Southern Bell, and one of my first duties in my new position was to arrange for and supervise the change from the magneto to the Law system at Richmond, Lynchburg, Norfolk and other exchanges that had already been constructed on house-top fixtures. I found fifty or sixty stations at Richmond already converted into Law system stations, with metallic circuit "call-wires" zigzagging hither and thither with so little regard for order or method that none connected with the exchange could tell me what sections of the city they reached, or what stations had been connected in on the two or three completed loops. On the day that I assumed charge I learned that one of the call wires had been "open" for a week or ten days, and the subscribers on it had been receiving a very precarious and unsatisfactory service, the operators being only occasionally able to catch their orders through leakage to earth. And no one could tell me which were the ends of the pair of wires forming each loop, or which of the call wires entering the office were the two that belonged to the defective loop. This necessary information, however, I soon obtained by a few simple tests such as I had been accustomed to make when locating troubles on telegraph wires, and I improvised a crude plug switchboard for the call wires, and began to test for the trouble on the defective loop. Having no record of the stations on it or the order in which they occurred, I was forced to set two of the most intelligent line men to the task of tracing the two wires from the office and reporting from each station as they came to them. Finally I located the fault between two contiguous stations, but the linemen reported the wire intact between those stations. A second and more careful test confirmed the correctness of the first test, and I ordered the two linemen to examine carefully every foot of the wire between the two stations, tracing it if practicable by the sense of feeling as well as by the sense of sight, from one building to the other. This they reported having done without finding a break in the wire. I confess that I was at first a little nonplussed, but finally concluded the trouble must be in a rusty joint, and learning that there was one unsoldered joint between the two stations I had it cut out and a new joint made, when the call-wire was found to be all right again. A careful test of the faulty joint disclosed the fact that the two ends of the tightly wrapped wires were thoroughly insulated from each other. Forty cells gravity battery could not force any "juice" through it nor was the much higher electromotive force of a magneto generator able to overcome the high resistance of the rusty joint. I had no galvanometer with which to measure the resistance, but it must have been way up in the thousands of ohms. My telegraphic experience and the practice of locating faults on telegraph wires with relay and bridge tests stood me in stead, and enabled me in a few hours to locate a fault that my predecessor had been searching for for a week in a haphazard and rule-of-thumb manner, during which entire period a dozen negro linemen were galloping over every house-top lead in the exchange, in a fruitless search for a broken wire.

I merely mention this unimportant incident to "point a moral," not to "adorn a tale." And the moral is briefly and proverbially, "every man to his trade." Had the interest of the telegraphers been enlisted in favor of the telephone in the incipiency of the exchange movement, many costly mistakes would doubtless have been avoided and the telephone would more rapidly have grown in popular favor. And with more economical management, and a more liberal policy dominating the telephone enterprises, mayhap the opposition now encountered by the "original Jacobs" might possibly have been avoided.

ADVICE FOR OPERATORS.

EVERY telephone operator, says Josephine E. Young, M. D., in the Operating Bulletin, should walk at least two miles every day. She sits eight hours at work indoors. She goes home to at least fourteen hours more of indoor air, and no matter how well ventilated the house or exchange may be, the air indoors can never take the place of that which we may have any time by putting our heads out under the open sky. . . . Walks can be taken before and after work and for fifteen minutes at the noon recess. Breathe deep with the diaphragm as you walk, and start out as if you expected something interesting at the other end. Such walking and breathing quickens the heart action, makes cold feet and hands warm, and brings a glow into the face.

A TALL TELEPHONE POLE.

NEAR Aberdeen the Independent Telephone Company recently erected the highest single piece of wood telephone pole ever planted in the world, says the Seattle (Wash.) Times. The pole is a single fir sapling 190 feet high and only eighteen inches in diameter at the base. The diameter at the top is five inches. The big pole was set to carry lines of wire across the harbor high enough to permit sailing vessels to pass without interference with the wires.

In The Rural Line Districts

Hazel has another telephone line. The farmers' line came in from Henry Thursday. The poles are up and the wire on. They will soon be doing business.—*Hazell (S. D.) Era.*

The rural telephone line is now extended as far as Carlson's, Lundell's, Peterson's and Erlandson's, so now we can talk with the world, too.—*Enok Correspondence Hallock (Minn.) News.*

The Barron County Telephone Company has just installed a new phantom circuit between Rice Lake and Chippewa Falls to relieve the regular wires during the rush hours. This is the first one put in by the Bell company and is worked without any wire—only the air and ground being used.—*Osceola (Wis.) Sun.*

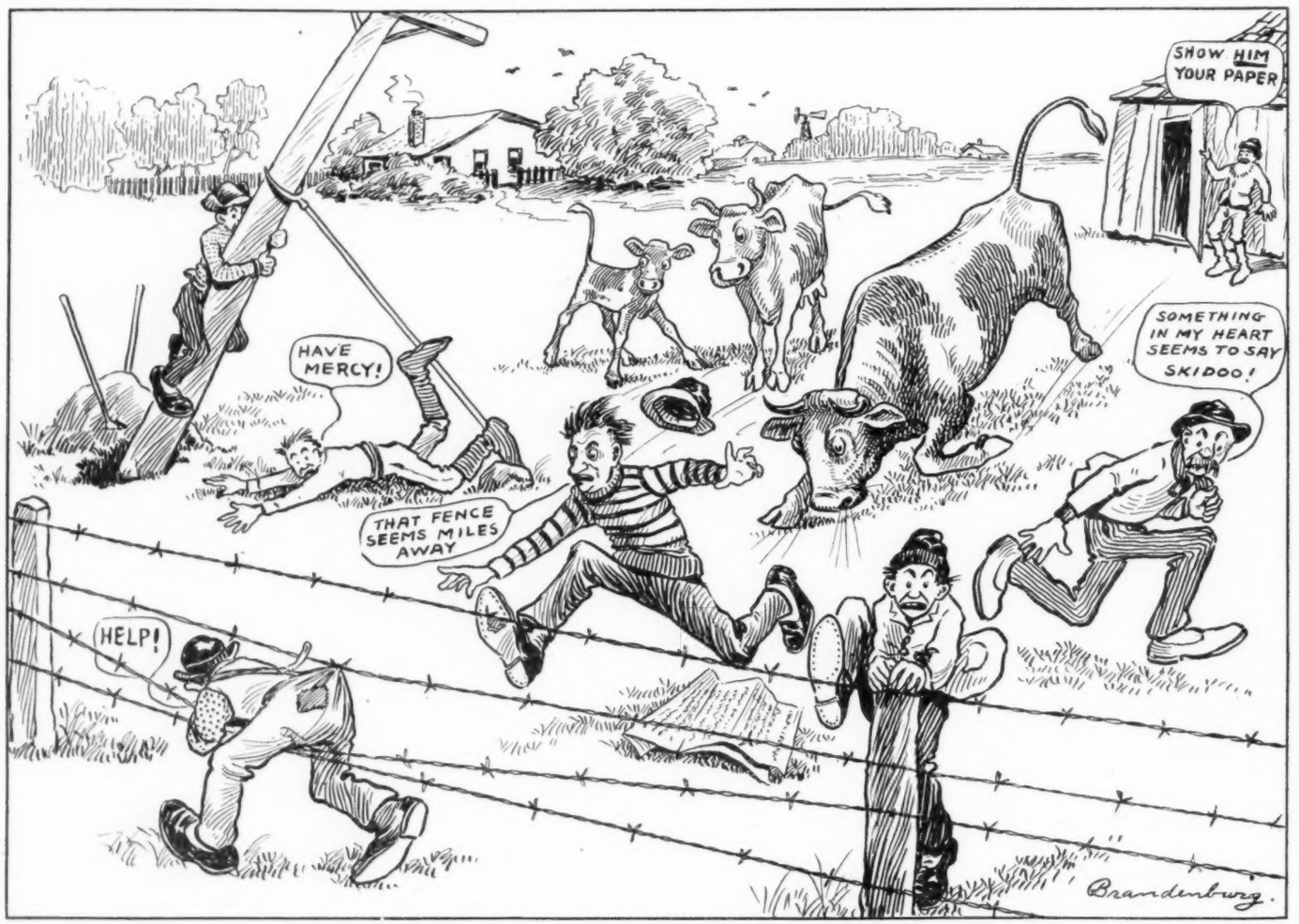
G. W. Greaves, manager of the Greaves Telephone, was in Grano last Friday and informed us that within the next ten days Grano would be connected with the outside world. Donnybrook has recently been connected with Tolley and Tolley is connected with Grano now. That is worth something.—*Grano (N. D.) Tribune.*

The Farmers' and Merchants' Mutual Telephone Company has installed sixty-six 'phones in Waubay up to the present writing. Several more are yet to be put in. The new telephone is the handiest thing—there is no ring up or ring off to it. Just take down the receiver and an electric light flashes on your number at central; when you quit talking hang up the receiver and the light at central goes out. Misses Winnie Hanna and Ada Butler are the operators.—*Waubay (S. D.) Clipper.*

F. H. Stow, superintendent, and A. P. Matthews, local manager of the Independent Telephone Company, have returned from a "thirteen" shooting trip to Tom Parmalee's ranch near Broken Bow. They shot at thirteen prairie chickens and bagged ten, which, with three ducks killed, gave them a record of thirteen game birds killed. —*Omaha (Neb.) News.*

C. B. Gale is now local manager in this city for the Pioneer Telephone Company. Mr. Gale was the local manager here last spring, and was transferred to Tishomingo. Among others, the band musicians of the city will be glad to welcome Mr. Gale back to El Reno. He is a "good Indian" as well as a good "wind jammer."—*El Reno (Okla.) American.*

Harry Anderson, who has been working as foreman of a telephone construction gang up in Michigan for some time, arrived in the city Tuesday to visit old time friends and relatives. He is the same happy Jack, but with age he is improving in looks. He expects to depart soon for Winnipeg, Canada, where he has some work in the telephone construction business.—*Audubon (Ia.) Advocate.*



A farmer found a score of men putting up telephone poles through his best field. He ordered the men out, but they wouldn't go. They showed him a paper that gave them the authority to put up their poles wherever they wished. The old man looked at the paper, saw it was lawful and walked silently away. He walked to the barn and turned a savage red bull into the field. The bull made for the men, the men fled at the top of their speed, and the farmer shouted: "Show *him* your paper."—*Colfax (Ind.) Messenger.*